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Payment for Environmental Services (PES): Insights from Kejie Watershed, Yunnan Province, Southwest China

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Summary

Upland agriculture and watershed conservation are often juxtaposed in China's sustainable development discourse. Intensive upland agriculture sustains the livelihoods of a majority of China's poorest farming communities, but is perceived as environmentally destructive. Deteriorating watershed quality has prompted efforts to convert agricultural land to forest and grassland, which reduces farmers' productive land. Resolving the impasse between upland food security and rural development, on the one hand, and the need to control watershed degradation, on the other, has become one of China's most pressing development challenges.

More recently, efforts to intertwine upland development interests with downstream conservation priorities have taken a new form. Recognizing farmers' lack of conservation incentives, government agencies and industry groups in China have begun to experiment with innovative payment schemes that attempt to offset farmers' opportunity costs for taking land out of agricultural production. These schemes range from national (e.g. Sloping Land Conversion Program & the Ecological Forest Compensation Program) to catchment (e.g., hydropower station-community agreements) in scale.

This paper provides an overview of the promise and pitfalls of payment mechanisms for watershed services in China's upland areas, drawing on a specific case study from Kejie Watershed. Although preliminary surveys and experience with actual arrangements have demonstrated its potential in China, payment schemes are regularly hindered by a lack of the awareness, market infrastructure, and institutional support necessary for their success. On the other hand, lacking of grassroot participation and poor governance structure in PES implementation has limited the success as its initial aimed.

The stakes are high, and continued experimentation and research is needed. Mechanisms that appropriately reward upland farmers for conservation provide an enduring match between upland development interests and watershed conservation. Failure to provide adequate rewards and appropriate policies and markets threatens farmers' food security and livelihoods, and consequently the viability of conservation programs.

What would work for PES in China

Security of forest property rights: Security of forest property rights is essential in order to give poor households control over, and right to benefit from, current Chinese policies and the environmental service they provide in the long run.

Social space for multi-stakeholders to negotiate and participate: A social space is important in order to facilitate negotiation, bargaining, and participation about improving

Enhanced local participation for payment schemes. However, at present, the limited participation by both local governments and residents in the design of payment schemes has impaired their willingness to pay; and, on the other hand, monitoring and evaluation by the tertiary sector is lacking in current policy implementation.

Good governance and a cooperative institution: For sustainable management of natural resources to guarantee environmental services can be provided and improved continuously and improvement of policy design and implementation to ensure environmental payment can be made constantly and fairly, a cooperative institution is needed to manage both sectors. This institution should be established through participation with multi-stakeholders. The institution should be transparent, accountable, responsive, equitable, and efficient in policy design and implementation.

Developing market mechanism: the integration of market mechanism in the PES is significant to enhance the effectiveness and equity, which state-led program has failed to address.

Introduction and Background

China is a mountainous country with poor forest resources. Hence the forest ecosystem at the headwaters of rivers plays a key role in environmental services for local people and those downstream. For half a century, a policy of forest exploitation in China led to disastrous consequences: degradation of forests and landscapes, loss of biodiversity, unacceptable levels of soil erosion, and catastrophic flooding. Given this dilemma in forest management, it is clear that how forestry policy and forest governance structure address the issues of payment for environmental services and poverty alleviation is a crucial issue in developing countries. In the mountainous regions of China, especially, where there are biodiversity hotspots and an enormous population living in poverty, it is a just concern not only for researchers and development practitioners, but also for government officials and central policy-makers. In this respect, people are not only seeking possibilities for market mechanism development, but are also focused on how current policy can be adjusted to arrive at a win-win situation of reducing poverty while improving forest and watershed conservation .

In China, socioeconomic changes have been occurring rapidly, significantly in the transition from a centrally planned to a market-based economic system. The forest sector in China lags behind other sectors in this transition process. The government has launched a limited program of decentralized reform, as it is concerned about negative environmental externalities caused by losing control of forest resources. The government held strict control even over collectively-owned resources through mandatory policies such as log harvesting quotas, logging bans, conversion of sloping farmland to forest, and establishment of nature reserves. Collective forests are a crucial component in farmers' livelihood development and environmental protection in China. In 1982, reform in forestland tenure was undertaken to create more incentives for forest owners to manage their land. In 1985, a centralized harvest quota system was established to control widespread illegal logging. In 1996, two types of forest classification were identified to serve different objectives: (1) commercial forests and (2) public beneficiary forests, and these became the working basis of the Forest Ecological Compensation Program.

In 1998, the logging ban component of the Natural Forest Protection Program was launched, characterized by a sizeable investment from the Central Government to strengthen the forest guard system. Owners of collective forests were stimulated when economic opportunities from forest resources arose as a result of market development. Some laws and regulations (e.g., Organic Law of the Village Committee) were favorable to collective forest owners. Challenges to the legitimacy of mandatory policies made by the government forest administration emerged. In 1998, following the Yangtze River flood, the failure of the log harvesting quotas and other forest policies instigated a policy shift from using mandatory instruments to applying more inductive instruments. That is, the government gave forest owners incentives to protect forest resources by providing subsidies, rewards, and taxation breaks, rather than forcing forest owners into compliance with the threat of penalties, taxation, and quotas. The Sloping Land Conversion Program is an example of this policy shift that subsidizes farmers by providing grain, cash, and saplings to encourage owners to convert sloping land into forestland or grassland to reduce soil erosion. However, the funding source for forest conservation is not so stable. It is unlikely that this program will be sustainable once funding is finished.

Clearly, most payment schemes for environmental services in China have been publicly financed, including the two forest conservation program introduced on a large scale by the central government. Current observations on the implementation of the payment schemes prompt us to understand the significance of policy perspectives on forest governance in this regard, rather than jumping into developing market mechanisms. From a policy perspective there are several critical issues that should be addressed.

This paper provides an overview of the promise and pitfalls of payment mechanisms for watershed services in China's upland areas, drawing on a specific case study from Kejie Watershed. Although preliminary surveys and experience with actual arrangements have demonstrated its potential in China, payment schemes are regularly hindered by a lack of the awareness, market infrastructure, and institutional support necessary for their success. On the other hand, lacking of grassroots participation and poor governance structure in PES implementation has limited the success as its initial aimed.

Service, Actors and Payment

The idea of PES is to provide incentives and benefits for people who now utilize environmentally valuable ecosystems in return for them agreeing to utilize them in such a way as to protect or enhance their environmental services for the benefit of a wider population (van Noordwiik, et al, 2004). However, until now, no formalized definition of PES schemes exists in the literature, which causes some conceptual confusion. The most widely accepted definition provided by Wunder (2005) of PES is that is based on five principals

- a voluntary transaction where
- a well defined ES (or a land-use likely to secure that service)
- is being 'bought' by a (minimum one) ES buyer
- from a (minimum one) ES provider
- if and only if the ES provider secures ES provision (conditionality)

Based on this definition, PES features contrast with those of some other conservation approaches. PES is generally more direct than approaches like Integrated Conservation and Development Project (ICDPs) which aim to indirectly promote conservation and explicitly combine conservation and development goals (Wunder, 2005)-or communicative instruments, which use communication to advocate certain types of environmentally positive behavior. PES is also generally more flexible than approach such as command-and-control systems or other protected area schemes (Leimona and Lee, 2008).

In China, the government leads the PES scheme with public finance. In 1999, central government has initiated largest ecosystem service payment policy to achieve the environmental goal of reducing soil erosion and desertification and increasing China' Forest cover and area by retiring steeply sloping the marginal lands for agricultural production. It is has been widely recognized as Sloping Land Conversion Program (SLCP) which aims to increase vegetative cover by 32 million ha by 2010. of this area, 14.7 million ha will be converted from cropland on steep slopes back to forest and grassland. Slope steepness greater then 25 degree is the main criterion by which plots are chosen for inclusion in the SLCP. In addition to the primary goal of reducing environmental degradation, two associated goals with the SLCP are to alleviate poverty and to promote local economic development (Liu, et al. 2008).

Under the SLCP, the government provide farmers 2,250 and 1,500 kg of grain (or 3,150 and 2100 yuan at 1.4 yuan per kg of grain) per ha of converted cropland per year in the upper research of the Yangtze River basin and in the upper reach of the Yangtze River Basin and in the upper and middle reaches of the Yellow River Basin, respectively. In addition, 300 yuan/ha per year for miscellaneous expenses and a one-time subsidy of 750 yuan/ha for seeds or seedlings are provided. The duration of subsidies depends on the outcome of cropland conversion: two years if the cropland is converted into grassland, five years if converted into economic forests by using fruit trees, or eight years if converted to ecological forests by using tree species such as pine and black locust. Furthermore, no taxes on the converted cropland are collected. By the end of 2005, 90 billion yuan had been invested in the SLCP. The SLCP began to receive more cumulative investment. The planned total investment in the SLCP will reach 220 billion yuan by 2010

Forestry line agency is primarily implementer of SLCP program, which state grain bureau and ministry of finance has been involved in the payment. This centralized on policy post the government at the buyer and farmers as the provider of the service, while the beneficiaries are a large group beyond the tax-payers and even the boundary. Since the actors from multi-level and sectors involved and the program plan makes significant allowances for diversity in local implementation, the degree to which compliance and outcomes are linked appears to be strongly contextual.

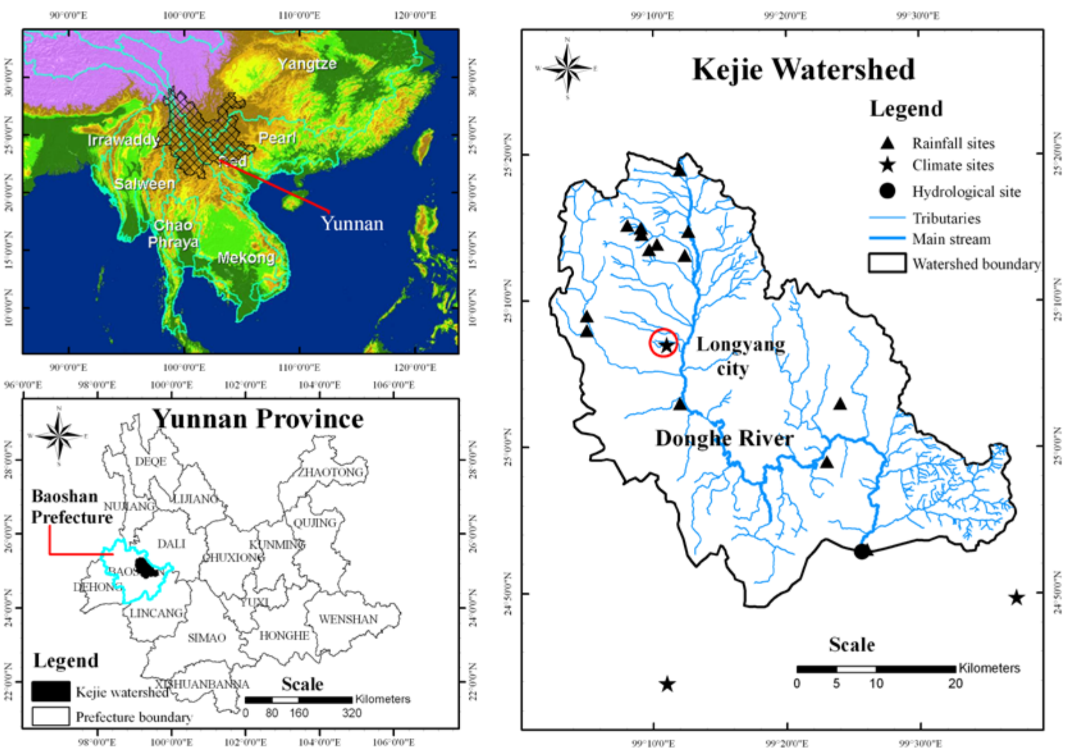
Research Site and Methods

Kejie watershed, lying upstream on the Salween, provides environmental goods and services to Baoshan Prefecture in Yunnan and downstream to Myanmar and Thailand. It is located in the western part of Yunnan at a latitude of 24°46′06″N -25°22′39″N and longitude of 98°55′47″E -99°40′28″E and covers a total area of 1,755 km2 (see below Map). Elevations range from 963 to 3076 masl. Donghe River, a major tributary of the Upper Salween, is the main water course and runs for 95.2 km with an average slope of 11° ranging from 1 to 88°. The valley includes Longyang City, one of the most productive farming areas in Yunnan, at elevations of less than 1,700 m. The mountain area is dominant with elevations of from 2000 to

3000 m. The climate is sub-tropical in the valley and temperate in mountain areas. Annual precipitation varies between 970 to 1290 mm with an average of 966.5 mm. The dry and wet seasons are clearly defined in this region. More than 80% of precipitation is in the monsoon from May to October, the wet season. The average temperature is 15.9°C with an extreme highest of 32.4°C and an extreme lowest of -3.8°C. Climate is influenced by topography also. Temperature decreases 0.6 °C with every 100 m of altitude. The main soil type is red soil. The natural vegetation of semi-moist broadleaved forest disappeared many decades ago and has been replaced by conifer with a mix of alder (Alnus nepalensis) and other broadleaved species.

There are 10 townships in Kejie watershed with a total population of 597,638 (2005). Longyang City is the political and economic centre of Baoshan Prefecture. Agriculture predominates: two crops a year are planted, corn in summer and wheat or barley in winter for the uplands; rice in the wet season and wheat in the dry season for the lowlands. Tea in the uplands, tobacco in the foothills, and intensive vegetable cultivation in the lowlands are common cash crops. Natural forests were replaced by pine forests when shifting cultivation occurred in the 14th century. More recent causes of deforestation are a) shifting cultivation, intensive planting of poppy and buckwheat, and overgrazing (early part of the twentieth century); b) cutting trees for fuel for the army, housing, and, road construction during World War II, c) logging for fuel for iron and steel refining during the 'Great Leap Forward' in 1958, and d) over-harvesting of forest resources following grants of individual household rights in the early 1980s.

Fig 1 Location of Kejie Watershed



This research is built based on previous research and data. Critical review of former study and data was the first stage applied in this report. Besides, the Participatory action research on public water sources, water demand, and supply was conducted in 2002, based on household interviews with 44 respondents in the watershed. User water demands (ownership, type, location, household/people, and water availability) were noted and the physical parameters of water (yield, temperature, conductivity, odor, color and taste) were tested. To better understand socioeconomic status, a participatory assessment was undertaken in 1998 by project staff, in concert with local villagers. This assessment utilized a range of techniques, including key informant interviews with government officials, farmers, and village leaders; village meetings; field observations; matrix score methods; participatory mapping on water availability and access to water resources for domestic and agriculture use; and policy review and analysis. Stakeholder meetings were organized in natural villages, administrative villages, and townships to introduce the principles of integrated water resource management and participatory action research at watershed level.

Results

Planning and Program Implementation

The planning and implementation process for the SLCP is much more complex program because its target population is much larger—millions of smallholders, not hundreds of state forest enterprises. It includes a much broader set of government agencies, and a great diversity of land-use types and technologies.

The program design is centralized. The central government first defines the overall area and scale of the program. The relevant provinces then formulate provincial SLCP plans; and submit these to relevant central government bodies, including the State Forestry Administration (SFA). Next, the SFA examines and balances the plans of various provinces; and, on the basis of this work, formulates the national SLCP plan, which is then submitted to the State Council for approval. Once the national plan is ratified, the SFA—jointly with other central agencies, such as the State Development Planning Commission—assigns tasks to the provinces according to this plan and requires the provinces to formulate annual implementation plans accordingly. The provinces then assign program tasks to lower-level governments, which in turn assign tasks to governments at even lower levels. Local-level governments—normally county forestry departments in cooperation with township governments—conduct field surveys and delineate tasks by household. These grassroots-level implementation annual plans are then reported up level-by-level to the SFA, which examines and approves the plans, sending them back down level-by-level to county-level governments and forestry departments.

Decision making Mechanism in PES

The SLCP involves government agencies at all levels. At the central level, the key players are the State Development Planning Commission, the Office of the State Council's Western Development Leading Group, the Ministry of Finance, the SFA, and the State Grain Bureau. The State Development Planning Commission and the State Council's Office of Western Development are responsible for overall planning and coordination. The Ministry of Finance is responsible for fund appropriation, management, and supervision, while the State Grain Bureau is responsible for providing grain compensation for farmers. The SFA is the highest government agency responsible for implementation of the Sloping Land Conversion Program. The SFA has established a Sloping Land Conversion management office, which is responsible for overall planning and annual plans and the management and supervision of implementation. The office is designed to be staffed by 30 people and is now staffed by 20. In addition, the SFA carries out field investigations and surveys in order to provide the State Council with advice for related decision-making. Governments at the provincial and county levels are held responsible by higher levels of government for the implementation of the SLCP within their jurisdictions. They are responsible for identifying priority areas for cropland conversion, providing the necessary conditions for implementation (such as matching funds), setting up leading groups to direct the work of relevant agencies, and examining and approving the proposed plans of relevant agencies. Provincial leading groups are typically made up of heads of planning, finance, grain, forestry, animal husbandry, agricultural, and land bureaus. Because many provincial governments are undergoing institutional reform and are very short-staffed, the provincial SLCP management office in some provinces is just a nominal body and is usually located in the Division of Afforestation in the Forestry Bureau. Due to the importance of forestry in southwestern China, forestry departments in southwestern provinces have greater authority and their SLCP management offices are generally much better staffed and effective.

Local-level forestry departments are considered the actual implementers of the SLCP. Departments at the county level, which are the lowest-level forestry authorities, shoulder the greatest responsibility in actual implementation of the program. Local-level forestry departments typically set up a SLCP management office to be responsible for formulation of relevant plans, implementation, monitoring and evaluation, management of program funds, formulation of specific management rules, and provision of technical support and saplings. Greater variation is seen at the county level in terms of SLCP management offices. Some of these offices are located in the county forestry bureaus, directed by a top official from the county forestry bureau, and staffed by forestry bureau personnel. On the other hand, some SLCP management offices at the county level are separately organized by the county government, with their staff coming from various county agencies. Research results also indicate that different county-level SLCP management offices have different levels of authority. Some have complete control over fund management, while others need to secure signatures of a deputy county mayor for final fund management decisions.

At the local level, other government institutions may be involved in implementation. The township-level governments are responsible for mobilizing and organizing farmers to implement the program on the ground. Another significant local government institution involved is the county-level land resources management bureau, which is responsible for issuing land use certificates. In some provinces, additional government agencies are involved at the provincial level. In Inner Mongolia, the Ecological Restoration Leading Group serves as a coordinating agency for the program, while in Province, that role is played by the Landscape Beautification Office.

Governance of Government-led PES

A number of line agencies are involved in the SLCP. They includes commission of planning commission of minority nationality affairs department of finance, department of grain supply, department of land, department of forestry and department of animal husbandry. Given those involvements of different agencies, it is already a difficult work to coordinate. Forestry agencies obviously is the main actors to implement this program. Therefore, regarding the governance issues, it is curial to examine who make decision and at what level is decision are make in the process of program implementation.

Since centralized control of land use the SLCP, there is a little space for local people to play. In the process of program implementation, we can easily found that forestry sector is dominating the process with assistance of township government. Based on the quota area of SLCP for each year, the Baoshan Forestry Bureau would distribute this quota to each township. The township would reallocate this quota to each village in accordance to village application and ecological priority.

Besides, there is a major principle for program implementation is to respect to local desires. This principle however is an ambiguous principle, which can be interpreted in different way. It can be that officials should respect local willingness in participation of this program. It also can be should respect local consideration in grogram implementation. In reality, there is only respect to local willingness to participate, however little respecting of local consideration. In Kejie, a number of farmers would to plant diverse tree species to meet their local needs. And also, several villages had expressed their interests in mixture of tree species plantations.

But, practically, walnut tree became the only species for plantation in most villages we visited. From official side, the walnut tree can be regarded as ecological tree with economic benefits in future. In the other words, the farmers can get 7 years subsidies recent, since regarding as ecological tree; and in the future farmers can get cash income from walnut selling. It is seem be a win-win strategy. Practically, density of plantation would excess to 85 trees per mu so as to be regarded as ecological tree plantation with 7 years subsidies. But, to have walnut harvest, there are only allowed 30 trees as maximum. Otherwise, there would never have walnut fruiting. In addition, future market for walnut is also unpredictable.

Given that much uncertainty, people have express numbers of concerns at the village level. In our investigation, whether can local people cut the walnut tree in order to promote the production of walnut are the most common concerns that local people think about. As a youth villagers said, if they cut the some of the walnut tree, it means turn the ecological forest into economic tree. In this respect, function and utilization of forest would be changed. It also would conflict with the initial objective of government who approval the program in the village. Therefore, it is quite reasonable to worry about it. Moreover, in case the walnut cutting is permitted, that large-scale plantation of walnut would also push the price of walnut rapid dropped down. In this respect, most villagers, who have experiences on previous government program of large-scale plantation on economic crop such as sugar can, worry about it very much. Therefore, selection of tree species is the very respect for questioning governance issues in the current trend of decentralization process, because it seems that centralization process has been promoted in SLCP.

In addition, selection of priority target area, preparation and distribution seedling tree, monitoring, elevations and so forth are all centralized in the forestry sectors and township government. Various task has increase the burden of local government. As a result, local government prefers to work on those place where is ecological environment without most difficulty. However, it is always opposite the initial objectives of SLCP.

As Zuo (2002) augured, Rushed implementation of the program has led to less than ideal results, as local governments have not had time to establish effective implementation systems. In addition, the burden on local governments in terms of personnel is quite high. Generally speaking, if a township is involved in the program, most of its own government staff will have to be involved for a period of more than two months annually. In some areas, local governments who are short of staff organize special teams to complete assigned tasks as quickly as possible. Clearly, this centralized structure of governance framework might not achieve both ecological and economic development in the mountainous watershed of Yunnan.

SLCP led Land-use and Hydrological Change in the watershed

From 1991 to 2001, forest increased by 50.1 km2, 119.7% of which was gained from grassland; grassland decreased by 132 km2 and 45.5, 39, and 15.5% of it had been converted to forest, barren land, and cropland, respectively; cropland increased by 40.3 km2, 64.1 and 50.7% of which was gained from barren land and grassland, respectively, and 12.8% of which had been converted to settlement respectively; settlement increased by 12D6 km2, 41.2, 31, and 22.3% of which had been gained from cropland, barren land, and forest respectively; barren land increased by 27D2 km2, 188D9 and 22D5% of which was gained from grassland and forest and 94.9 and 14.3% had been converted to ropland and settlement respectively; water bodies increased by 1.8 km2, 109D5 and 35.1% of which was from forest and barren land and 47D3% had been converted to settlement.

From 2001 to 2006, forest increased by 123D6 km2, 44.8% of which was gained from cropland, 33D6% from grassland, and 20D1% from barren land; grassland decreased by 75 km2, 54.7% of which had been converted to forest, 38D2% to barren land, and 5D8% to settlement; cropland decreased by 97D8 km2, 55D7% of which had been converted to forest, 30D9% to barren land, and 15D2% to settlement; settlement increased by 28D2 km2, 52D8% of which was gained from cropland, 28D1% from barren land, and 15D6% from grassland; barren land increased by 27D9 km2, 103D6% of which was gained from grassland and 109D4% from cropland, whereas 88D6% had been converted to forest and 28.6% to settlement; water bodies decreased by 4.8 km2, 42.4% of which had been converted to forest, 24D4% to barren land, 24.1% to cropland, and 16.6% to settlement. Thus, it is hardly to use this result to interpret that the SLCP lead to a great environmental output.

Discussion

Ecological Outcome of SLCP

The SLCP program is current ambitious project that government would to re-adjust the negative of rapid economic development on ecological environment by tree plantation. It is also the main grogram to deal with heavy soil erosion in the mountain watershed. However, due to the weakness of governance framework in program implementation, the ecological consequences can be foresee is not as good as SLCP initial design. Achievement of original objects is restricted by poor implementation of the program. Poor defining and misdefining priority target area are the main factor to constrain the objective achievement. A number of land with high productivity and less steep slop were converted became a common phenomena which researcher observed. As a result, in comparison with agriculture cultivation, control of soil erosion through this program is problematic. Therefore, strictly obeying by the policy to define the priority target area can be one of the ways to avoid this.

Moreover, due to simplification and short-cut implementation of SCLP, less choice in tree species and centralized control of tree selection might result the new problem of monoculture. Ecologically, monoculture in plantation had been verified at the worldwide, which might cause economical and ecological instabilities, such as market surplus, disaster of insect. It is clear diversification of species plantation is curial. Fundamentally, therefore, promotion local participation in decision-making of tree selection is core for improving the promising outputs of SLCP. Also, it is the principles of the SLCP policy------respect for local desire. In the other word, official should not only respect for local willingness but more carefully consider local needs.

Socio-economic Implications

Socio-economic factors are critical aspects in SLCP. With the subsidies from government, it provides the incentive of local people to involve in this program for tree plantation and management. Also, SLCP has the sense of poverty reduction aim, due to subsidies offering. In this respect, SLCP is main current force for agrarian transformation. Based on initial idea of central government, converting less productivity land and providing subsidies can play the role to balance social inequity, which are resulted from difference in geographical and ecological factors. It also aims to promote re-distribution of welfare via government activities.

However, poor implementation of the program has cause further agrarian transformation and social differentiation. As discussed above, lack of information made most of “remote villages” lack of recognition the potentials of benefits and advantages of this program. In contrast, the villages where information can easy reach can not only get benefit from SLCP, but also earn more from the program at expense of those “poor and remote villages”. In this case, the compensation for poor has unexpectedly gone to the rich villages. This social differentiation might cause the further social problem. Therefore, transparency of information and information dissemination is essential for the program implementation at the first place. Also, this transparency can limit the chance that the one have access to authority get more benefit. It consequently can improve social justice and social equity.

In addition, in term of further market development, as discussed above, emphasised on one or two species of fruit tree plantation might result further market surplus of products. Eventually, the farmers would suffer from that. SLCP as a strategy to restructure local economic structure, therefore, should well consider diversification of rural production. Enhancement of local participation in this case can achieve the goal of diversification of local production and economic structure and improve stability of local economy.

Policy Implications

It is clear the ecological and social-economic gaol eventually can be achieved via political adjustment. The negative and unexpected consequences somehow are all resulted from the weakness of governance framework in a political sense. In addition to enhancing transparency of information, local participation in decision-making and social equity, there are still several points should be highlighted here.

Security of property rights as the fundamental issues in creating farmers’ incentive should be considered. We do not mean privatization is the best to security land tenure. However, respect for local rights of resource use and extend the contract periods are the significant strategies should be adopted. Besides, use rights of land and forest should be heritable in legal space. And, village counts should be established to defend local rights.

Finally, as argued above, SLCP is a centralized program in the current tendency of decentralization process. As a result, democratized local body can play a little in this program implementation, which obviously restriction the political reform of decentralization. As mentioned, this centralized program has not only increase the burden of local government, but make the program inefficient and ineffective. Clearly, increasing the role of democratized local body in the program implementation can improve the ecological, economic and social outcome and consequences of SLCP.

Conclusion

As the largest state-led PES program, SCLP has been provides a insights and arguable PES schemes that with numerous government influences. While addressing the issues related to ecological effectiveness, participation/voluntarism and social equity, the SCLP has been economically and timely efficient in term of largest vegetation recovery and great population of social benefits, which also resulted from comparative low transaction cost. This typical positive side of the centralized and state-led PES schemes differ from other mechanism of private-sector and market schemes where the high transaction and facilitation cost might always require an additional actor involved as breaker.

However, it is also clear this centralized PES could be improved significantly through the strengthening the good governance structure, which require much more meaningful grassroots participation in decision-making at all the levels. The institutional capacity should be built to ensure public participation as in many forms. Furthermore, security of property rights is a precondition to enable local participation and negotiation in PES. The integration of the market mechanisms also provides a potential to improve the program, while market infrastructure and different financial instruments should be well developed.

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A Study on the Water Allocation in Kunming

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1. Water Allocation Policies

1.1 Water Resource Policies in China

In China, water resources are owned by the state, which promulgates laws and regulations to guide the allocation of water resources. For the time being, there are four important laws and regulations: Water Law of the People's Republic of China enacted on October 1st, 2002, Regulation on the Administration of Water Permit and the Levy of Water Resource Fees enacted on April 15th, 2006, Interim Measures for Water Quantity Allocation effective as of February 1st, 2008 and Measures for Administration of Water Permit effective as of April 9th, 2008.

According to these laws and regulations, the state allocates water resources to administrative regions from the top to the lowest level in accordance with the total water quantity available for allocation, and in line with the water quantity consumable in domestic use and production in administrative regions of all levels.

Water resources in China are under the uniform management of the state. And Ministry of Water Resources (MoWR) is the administrative department responsible for the management and supervision of water resources around the country. Water resources agencies at all levels are responsible for the management and supervision of water resources in their respective regions. In addition, the State Council has established seven River Basin Commissions, which respectively manage and supervise the development and utilization of water resources in seven main river basins.

In China, water resources are theoretically allocated according to the following five principles. Firstly, water resources are owned by the state, and the State Council, on behalf of the state, exercises the right of ownership. For water resources, the state applies a management system that combines a river basin and administrative regions to allocate water resources. And the Ministry of Water Resources under the State Council is in charge of the management and supervision of all the water resources. Secondly, on the basis of river basins and administrative regions, the water resources agencies formulate and approve unified and strategic plans on water resources, which shall be abided by in development and utilization of water resources. And the Development and Reform Commission (DRM) and MoWR both under the State Council are responsible for the macro-allocation of water resources around the country. Thirdly, according to the laws, the state implements a system of water permit and payment for water use, and water gross and ration are two major instruments to allocate water use. Fourthly, water resources shall be allocated in accordance with the principle of fairness and justice. And in accordance with the conditions of water resources, the past and present water supply, and future water supply and demand in different river basins and administrative regions, and also in line with the requirements of building a water-saving society, the state shall take into consideration the interests of the regions in both upper and lower reaches and on both the right and left banks of a river, balance the use of surface water and groundwater and the use of water in the river and outside it, and make an unified plan on water supply for domestic use, industry/agriculture and ecological environment. Fifthly, rational arrangements for development and multipurpose use of water resources shall be made according to the principle of combining the tapping of new sources with saving water, giving priority to saving water, and water re-use. And the government shall first pay attention to satisfying the need of domestic water of urban and rural residents, while taking into account the need of water in agriculture, industry and ecological environment, and the need of navigation. In areas where the water sources are insufficient, the scale of the cities and the development of industrial, agricultural and service projects which use a large amount of water shall be restricted.

Under the guidance of these principles, water resources are allocated in strict accordance with unified plans, procedures of approval and implementation, and quota. Water resources agencies and Development and Reform Commissions at the each level will examine and approve the water resource development projects. According to river basin plans, medium- and long-term plans of water supply and demand, the approved water allocation plans and the predicted annual volume of in-coming water, River Basin Commissions and the local water resource agencies shall regard river basins as a unit in formulating water allocation plans that regulate runoff and store water in order to allocate and distribute water.

Any organization or individual that takes a large amount of water directly from rivers and lakes or from underground shall, in accordance with water permit and payment for water use, apply for the licenses of water permit and pay water resources fees, in order to acquire the right to take water. Water quantity to be examined and approved by relevant authorities shall not exceed the water ceiling of a water basin or administrative region. In a river basin or administrative region where water quantity examined and approved reaches the ceiling, no more water shall be approved. Organizations or individuals shall use water according to the approved annual plan. Water used shall be measured, and one will pay more for water use if one exceeds the permit in the plan and the quota.

Regarding water resources development projects, the government examines information on hand, development plans and water demand in society, and approves the projects in accordance with relevant procedures. In order to strengthen and regulate the water resources development projects, MoWR issued the *Interim Measures for Administration of Investment Plans of Capital Construction of Water Conservancy* on October 30th, 2003.

1.2 Water Resources Development

Water is regarded as a public good and is owned by the state which is the main investment body in the development and utilization of water resources. These make the government play the most important role in the development and utilization of water resources. Government makes decisions on water resource development projects according to certain procedure, approach and standard. There are four stages: the proposal of projects, the feasibility study of projects, the construction of projects and the operation of projects.

In the first stage, projects of developing and utilizing water resources are proposed. Water resources agencies can propose development project within their respective jurisdictions. Other interest parties can also propose water development project through various approaches. During annual meeting, People's Congress and CPPCC raise proposals when relevant departments have not paid attention to water resources development projects, which concern people's livelihood. Experts in various fields can suggest water resources agencies to propose water resources development projects according their studies. Media can also gather public options and pressure government take measures to deal with water resources issues. For example, media plays a very important role in Dianchi Lake governance. Since 1990s, the pollution of Dianchi became worse. Lots of experts, scholars and citizen called on the government and society to do something to protect Dianchi by media. Due to the influence of media, the government paid more attention to the Dianchi governance.

In the second stage, the feasibility study of the projects is undertaken. After the proposal is examined, Development and Reform Commissions approve the proposal to undertake feasibility if the proposal in line with social-economic development. The feasibility study will produce several reports for further examine. The reports often include technical feasibility report, economic feasibility report, environment impact assessment report, and resettlement plans if necessary. These reports will be the most important documents to be appraised. The feasibility study will require tenders from various institutes, like surveying and design institutes, which have licenses, issued by government. The feasibility study reports will submit to government agencies to review and approve.

In the third stage, the projects shall be constructed. After the feasibility study ad design, Financial Department shall place the projects, which meet the requirements in the annual budget. When money for the projects is ensured and a construction tender will choose proper constructors and monitoring companies. A steering committee often forms to supervise the construction. Qualities Institutes and government departments will be invited to assess the construction and submit a project completion report.

The fourth stage is the operation of the project. If accepted, the projects can transfer to city water supply companies, a state-owned company and start to operate. Pricing Bureau of Development and Reform Commission will decide the water price.

According to the stages above, the government governs the development and utilization of water resources based on laws, procedures and the leads of government.

2. Water Supply and Demand in Kunming

2.1 Water Resources

Kunming is among the 14 cities, which suffer severe water shortages. According to the statistics in 2007 from Kunming municipal Bureau of Statistics, the annual per-capita amount of water resources in Kunming is 1,180 cubic meters that is only 55.44% of that of China and 10.93% of that of the world. In Kunming, water supply mainly relies on surface water supplemented by groundwater. Its average amount of water resources is 7.313 billion cubic meters (Bm3) per year, of which 75% (or 5.5 Bm3) comes from surface water and 25% (or 1.798 Bm3) from groundwater.

Rivers in Kunming municipality belong to three main river systems: Jinsha River, Panlong River and Yuanjiang River. There are 61 rivers with a catchment area greater than 100 km^2 such as Panlong River, Tanglangchuan River, Pudu River, Ba River and Baidu River. There are three main lakes in Kunming, Dianchi Lake with an area 298 km^2, Yangzonghai Lake with an area of 31.9 km^2 and Qingshuihai Lake with an area of 7 km^2. The average water storage capacity of these three lakes is 2.22 Bm3 per year.

Yunlong Reservoir, Songhuaba Reservoir and Dianchi Lake are the surface water sources around Kunming City. With a catchment area of 749 km^2, Yunlong Reservoir has average annual runoff of 454 Mm3. With a catchment area of 595 km^2, Songhuaba Reservoir has average annual runoff of 210 Mm3, while that of the Dianchi Lake, with a catchment area of 2,920 km^2, is 750 Mm3. Besides, there are over 300 wells (groundwater sources) in Kunming including Jiulong well Heilong well, Bailong well, Longtan well in Haiyuan temple. Annual rainfall distribution is uneven. Every year, during the rainy season from May to October, the rainfall is 84-90% of the whole year. But during the dry season from November to April of next year, the rainfall is 10-16% of the whole year. Every reservoir stores water during the flood season. In addition, Dianchi Lake drainage area can support the gross of water more than 1000 Mm3 per year. The water demand of Kunming citizen could have been met by Dianchi Lake drainage area. However, Since 2001 Dianchi Lake has been abandoned as a source to domestic use because of water pollution. Kunming has to look for other water resources outside.

At present, the main sources of water supply tapped by Kunming are Yunlong Reservoir, Songhuaba Reservoir, Dahe Reservoir, Chaihe Reservoir, Baoxianghe Reservoir, Hongpo Reservoir and the water-taking station of Shalanghe River. The whole system is often called as ‘six reservoirs and one station’ (Figure 1).

Figure 1: Map of Water Supply Sources to Kunming City

2.2 Social and Economical Development in Kunming

Two factors are crucial to regulate water demand and supply in Kunming. One is the increasing growth of population and urbanization. In 1949 when People's Republic of China was established, the city of Kunming was only an area of 7.8 km^2 with a population of 192,700. In 2006, the urban area of Kunming reached 233 km^2 with a population of 2,319,600. From 1950 to 2006, its population grew by 6.88 times. Especially after 1978, its population grew quickly (Figure 2).

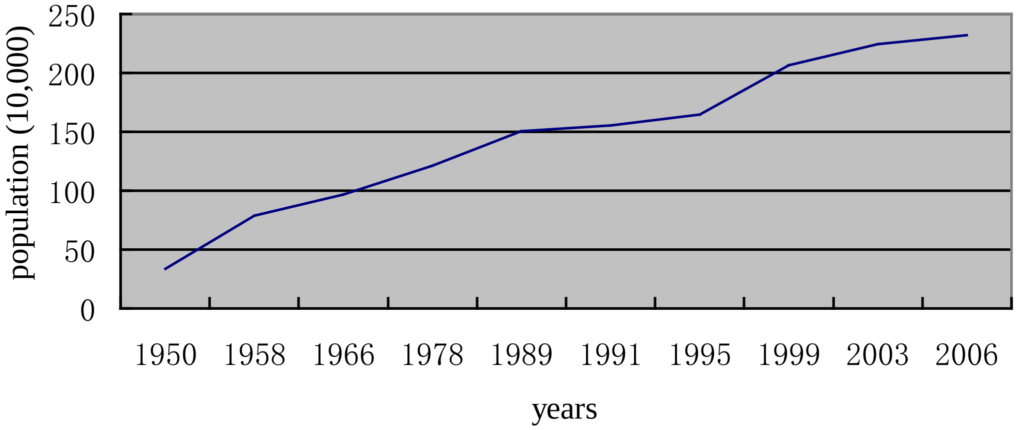

Figure 2: changes of population in the city

Data Sources: China City Statistical Yearbook (1990-2007)

The other is the social and economical development of Kunming. From the year 1950 onward, its economy has changed from agriculture dominance to industry dominance. From 1950 to 1965, its economy recovered and laid the foundation for industrialization. During the Cultural Revolution from 1966 to 1976, its economy stopped growing because of the political turmoil. After the Cultural Revolution, its economy gradually got on the right track and has grown steadily ever since. Figure 4 shows the GDP growth of Kunming during the period from 1952 to 2006.

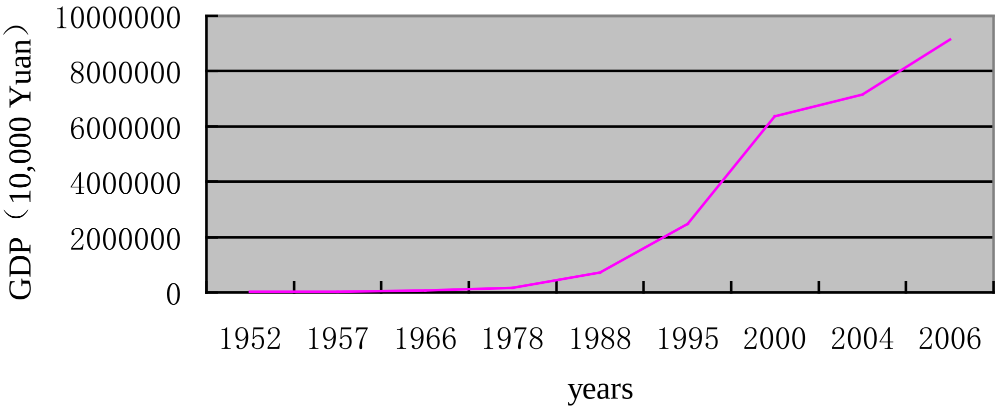

Figure 3: growth of GDP

Data source: Statistics Bureau of Kunming municipality

2.3 Water Demand and Supply

Economy growth and population increase result in fast urbanization and a demanding for more water in Kunming. After 1978, its urban water consumption increased annually by 10%, and the conflict between water demand and supply is becoming increasingly evident. In 1978, there were 3 waterworks in the main city and in 2006, there were 10 water supply facilities (Table 1). The domestic and industrial uses of water increased dramatically. During the 28 years from 1978 to 2006, the annual total water supply increased by 6.8 times from 53 Mm3 to 365 Mm3. In Kunming, water use includes domestic use, industrial production and irrigation.

The gross of urban demand generated pressure on water resources after 1978. Since 1982, water in Songhuaba Reservoir is no longer used for irrigation and has been used for domestic use of urban residents. From 1992 onwards, due to other water sources were polluted, Songhuaba Reservoir became the most important water source of Kunming City. It became even more important after 1998, when the pollution of Dianchi Lake became increasingly severe. The water taken from the Lake was gradually reduced and had to be stopped in 2001. The Songhuaba Reservoir then provided 450,000 m3 per day, which was 50% of the total water supply to Kunming. In 2000, the daily demand for water of urban residents was over 310L per person per day but the daily water supply was 300L per person per day or so. In 2004, because of the drought, water in reservoirs reduced severely and caused the shortage of drinking water of 360,000 residents. In 2005, Kunming suffered the drought which could be seen once every 50 years and caused the shortage of drinking water of 570, 000 residents.

Table 1 Change in Water Supply of Kunming

Year	No. of waterworks	Industry water use (10,000 m3)	Domestic Water use (10,000 m^3)	Water consumers (10,000 P)
1954	1	4.50	92.40	15.43
1965	3	504.88	757.31	52.61
1977	3	1328.58	1595.88	66.93
1984	4	2926.80	3738.32	85.00
1988	4	5369.00	4087.00	116.00
1990	5	5782.00	5094.00	118.00
1998	8	10946.00	7926.00	173.06
2004	10	4039.00	14565.00	204.23
2006	10	4370.00	14619.00	220.00

Data source: Kunming municipal Bureau of Statistics

Industrial water use has been increasing with different sources in different period. Before 1960s, water for industrial use in Kunming was taken directly from Dianchi Lake and aquifers, and after 1970 it was supplied by water supply companies. For several decades, the scale of industry in Kunming has been expanded so that the water consumption in industrial production has increased significantly. For example, water consumption in industries in the lakeshore area of Dianchi Lake was 10.16 Mm3 in 1952, 18.56 Mm3 in 1962, 43.2 Mm3 in 1972, 87.32 Mm3 in 1982 and 124.5 Mm3 in 1985. And the annual increase rate was about 10%. Water consumption in industries of Kunming increased by 6.72% annually from 40.95 Mm3 in 2001 to 43.7 Mm3 in 2006. In Table 1 water consumption in industries declined significantly from 1998 to 2004. The reason is that the government limited the water supplied by waterworks for industries in order to guarantee the supply of water for domestic use of urban residents. Meanwhile, in order to avoid water shortage, industries had been allowed to take water from Dianchi Lake again and from underground, and also encouraged to use recycled or second water.

After the foundation of People's Republic of China, agriculture in Kunming has further developed. A lot of water conservancy projects have been constructed and water-saving irrigation technologies popularized and applied. Since 1995 water from Songhua Watershed was no longer used for irrigation but solely for cities. Dianchi Lake is polluted and could not be source to domestic use. So water for irrigation was mainly taken from Dianchi Lake because of its water was polluted and stopped using for cities, and from rivers and reservoirs in the irrigation area. And because the water used in irrigation is only a small part that is under 3% of the annual runoff volume of Kunming, it has little influence on the urban water supply. In 2006, under the jurisdiction of Kunming municipality, there are 129,500 *mu* of farmland and 22,100 *mu* of forestland. Their annual water demand is 210 Mm3 which is 2.87% of the annual runoff volume of Kunming.

2.4 Challenges

Kunming is faced with three challenges in development and utilization of water resources.

The first is rapid growing population and the demand for water. By the end of 1988, Kunming Tape Water Company (KPWC) is responsible for supplying domestic water to 1.66 million residents or 134,000 households. The annual water consumption was 40.87 Mm3 and 35.23 cubic meters per capita. By June of 2007, KPWC was responsible for supplying domestic water for 2.2 million residents or 370,300 households. The annual consumption rose to 330 Mm3 and 150 cubic meter per-capita annum.

The second is the over abstraction of groundwater. As the society and economy develop, conflicts between domestic water and production water occur. Enterprises accelerate over abstraction of groundwater in order to meet needs of increasing production. Abstraction of groundwater was 10,500 cubic meters in the early 1950s, 29,100 cubic meters in the 1960s, over 100,000 cubic meters in the 1970s, 101,500 cubic meters in 1980 and increased to 165,600 cubic meters in 1983. And at its maximum, the abstraction of groundwater was one third of the total water supply.

The third is water pollution. The over-abstraction of groundwater results in the decline of aquifers in some areas. The polluted surface penetrates into deep ground water. Some springs are dried out and some are polluted and can not be drunk. This worsens the situation of water supply in the city. In 1988 the Fifth Waterworks of KPWC had to be closed because Dianchi Lake was polluted. This waterworks had been taking 150 Mm3 water annum from Dianchi Lake. Many water sources like springs and Dianchi Lake are polluted and go out of use. New sources have to be found.

3. Water Resources Management in Kunming

3.1 Water Resources Management

Kunming Municipal Bureau of Water Resources, Municipal Commission of Development and Reform, and Municipal Bureau of Public Utilities are the most important government entities in charge of water development projects. Kunming is one of the fourteen cities in China that suffer from severe water shortages. In order to protect water resources and to increase the efficiency of water use, Kunming City has, in accordance with the laws and regulations of the state and Yunnan province, formulated and issued a series of local regulations and measures (Table 2). These show that the government tries to strengthen the control of water use and make the governances of water resources systemization.

Table 2: List of Regulations and Measures of Water Management in Kunming

Regulations, Measures and rules	Promulgated on	Enacted on	By
Regulations for Administration of Protection Zone of Songhuaba Water Sources of Kunming Municipality	1989.12.29	1989.12.29	Standing Kunming Municipal People's Government
Measures for Administration of Groundwater Resources of Kunming Municipality	1994.5.24	1994.5.24	Standing Kunming Municipal People's Government
Implementation Measures of Kunming Municipality on the Rules of Water Supply of Cities	1996.4.24	1996.4.24	Standing Kunming Municipal People's Government
Rules for Administration of Water Conservation of Cities of Kunming Municipality	1997.2.17	1997.2.17	Standing Kunming Municipal People's Congress
Measures for Administration of Construction of Water Facilities of Cities of Kunming Municipality	2004.2.25	2004.5.1	Standing Kunming Municipal People's Government
Penalty Measures for Administration of Water Conservation of Cities of	2004.5.9	2004.7.1	Standing Kunming Municipal People's Government

Kunming Municipality			
Rules for Administration of Water Supply and Use of Cities of Kunming Municipality	2009.4.10	2009.7.1	Standing Kunming Municipal People's Congress

Kunming Municipal Bureau of Water Resources is responsible for allocation of water resources within Kunming administrative boundary. The development and allocation of water resources must be in accordance with Kunming socio-economic development plan coordinated by Kunming Municipal Commission of Development and Reform. Meanwhile, the government emphasizes that its work shall comply with the principles of rational use and scientific protection of water sources, combination of the planned use of water with water conservation, giving priority to the domestic use of water of residents while taking into consideration of water use in industry and other uses, and encouraging the use of advanced technologies and facilities for effective water sue. And water management includes the tapping of new resources and saving water sources.

3.2 Management of Water Development Projects

According to the Interim Regulations for Administration of Investment Projects of Kunming Municipality enacted on February 6th, 2007 and the Regulations on Procedures of Major Decisions of the People's Government of Kunming Municipality enacted on December, 1st, 2004, the Kunming Municipal Commission of Development and Reform is in charge of the appraisal and approval of investment projects, including water development projects on behalf of Kunming Municipal People's Government. The Kunming Municipal Bureau of Finance is responsible for managing and supervising the financial activities concerning the construction of projects invested by Kunming Municipal People's Government; and other relevant departments within their limits of specified powers are responsible for supervising the investment of the government. And the Kunming Municipal People's Government has the final say in the investment projects. It can, in accordance with the importance of the issue, hold working meetings of the mayor, executive meetings of the Kunming Municipal People's Government or its plenary meetings in order to make decisions. And as for the issues of special importance, the municipal government first holds consultative meetings to listen to the opinions from deputies of the Kunming Municipal People's Congress and Kunming Municipal CPPCC Committee, and from people's organizations, and then holds executive meetings or plenary meetings to discuss the issue, and finally the discussion reports shall be submitted to the Kunming Municipal CPC Committee for examination and approval. Figure 5 shows the system of management of investment projects and the decision-making procedures of the municipal government.

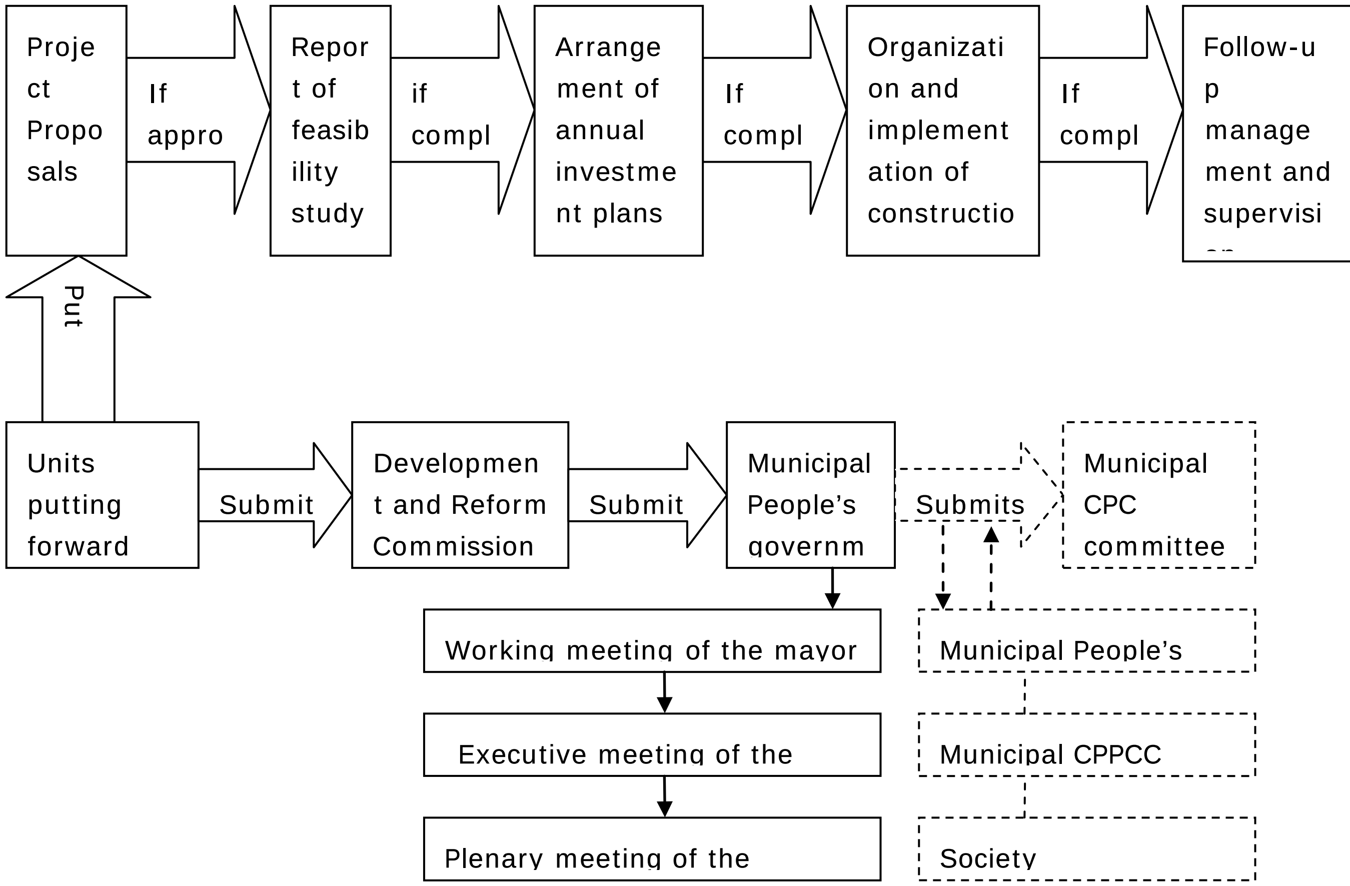

Figure 4: the system of management of investment projects and

3.3 Management of Water Demand

Kunming applies incremental price and other measures to encourage water conservation. Running water and exploited groundwater shall be metered and their fees shall be charged separately.

The incremental water price can automatically regulate the demand. It is required in Kunming that water shall be metered and fees shall be charged. Water is charged according to five categories. These five kinds include: water for domestic use, water for public use, water for industrial and agricultural use, water for service sector, and water for special use.

In the aspect of domestic use of water, the incremental charges are applied. If the monthly water consumption of a household is within 10 cubic meters, the fee is charged at CHY3.45 per ton. Additional water used over 10 cubic meters, incremental charge shall be applied as: if the additional consumption is within 1-5 cubic meters, 50% more shall be collected; if the additional consumption is 6-10 cubic meters, 100% more shall be collected; and if consumption is over 11 cubic meters, 150% more shall be collected.

In the past twenty years, the price of domestic water has dramatically changed. Before 1990 the rice was CHY0.14 per ton. In September of 1990, the price was raised for the first time. And after that, continual increase of the water price have been undertaken (See Table 3).

Table 3: Domestic Water Price Change in Kunming from 1990 to 2009

Years	Pre-adjustment price (Yuan per ton)	Post-adjustment price (Yuan per ton)	Notes
1990	0.14	0.22	
1993	0.22	0.32	
1996	0.32	0.6	
1999	0.6	1.2	
2002	1.2	1.8	Including charges of sewage treatment
2006	1.8	2.8	Including charges of sewage treatment
2009	2.8	3.45	Including charges of sewage treatment

The Kunming Municipal People's government exercises unified management on development and utilization of groundwater, applies the system of water permit, collects fees of water and charges a progressive higher price for the amount that exceeds the quota. The several principles guide the exploitation of ground water. In an area where the tap water can guarantee the supply and groundwater reserve is small, the exploitation of ground water shall be controlled. The fee of groundwater shall be charged equally to the price of tap water. In an area where the tap water can not guarantee the supply and groundwater reserve is abundant, the groundwater must be exploited. The fee of groundwater is 50% of the price of tap water. The charge for using groundwater by township enterprises and by other production and business units in rural areas is 30% of the price of tap water. When groundwater is used for emergent water sources of domestic use and production use, its fee shall be not lower than the price of the tape water and specific standard of charge shall be formulated separately; as for unauthorized use of groundwater which exceeds the quota, its charge shall be 2-5 times as much as the standard.

Measures of rewards and punishments are also applied to management of water demand. Firstly, In Kunming, all organizations have to make annual water use plan and submit to relevant departments. Those who have outstanding achievements in saving water shall be rewarded, and those whose water use exceeds the approved plans shall be punished. Secondly, water consumers are encouraged to use advanced water-saving technologies and facilities and to use recycled water. The government encourages the construction of facilities of using recycled water, promotes the use of recycled water and subsidizes the project of using recycled water.

In order to ensure that the water-saving measures are implemented, the municipal government has issued the *Punishment Measures for Administration of Water Conservation of Kunming Municipality*. For example, it requires that water consumers shall be punished if the following conditions occur: they don't renew the facilities as is required or stop using water-saving facilities without authorization; their rates of using recycled water do not meet the requirements; they discharge water directly while it can be recycled and used for multi-purposes as is required; and they do not recycle cooling water of facilities as is required.

The special office is established to manage and guarantee the implementation of water-saving measures. The Kunming Municipal People's Government prescribes that the Kunming Municipal Bureau of Public Utilities is the administrative department for water use and water saving. And the Kunming Municipal Office of Water Supply Planning and Water-saving is responsible for the implementation of specific tasks. Meanwhile, departments under the Kunming Municipal People's Government popularize water-saving polices, promote water-saving techniques and enhance the water-saving awareness of the residents and the organizations.

3.4 Management of Water Supply

Kunming City has taken several measures to manage water supply. These measures include tapping new sources and diverting water, protecting water sources, regulating the management of water production and operation facilities, strengthening coping with the emergency water supply, and encouraging the use of advanced technologies and facilities.

In 1959, Songhuaba Reservoir was first built to hold 70 Mm3 of water for flood prevention and irrigation. After 1960, it began to supply water for the city. In 1988, the expansion of the reservoir was started. When the expansion was completed, the reservoir could supply 150 Mm3 of water.

In 1999, another water diversion project was put into construction. This project diverted water from Zhangjiuhe River to supply Kunming with annual flow of 250 Mm3. Yunlong Reservoir was then built to store the water. The water-diverting project of Zhangjiuhe River includes the project of water source, the project of water conveyance and the project of water purification and distribution. The project of water source is the construction of Yunlong Reservoir which was started on December 19, 1999 and completed on March 1, 2004. Its capacity is 454 Mm3 and the volume of annually diverting water is 250 Mm3. The water is transferred to pass Luquan County, Fumin County, Wuhua District and Panlong District. Its length is 98 km. The project of purification and distribution gave way to the construction of the seventh water treatment station which is designed to supply 600,000 m3 of water a day and is the largest water purification plant in Yunnan province.

In 2007, another project diverting water from Qingshuihai Lake was initiated, with partial financing by ADB. The Qingshuihai Reservoir will be completed in 2011,.When completed, it will have a capacity of 169 Mm3. The reservoir is designed to be the multi-year regulating storage reservoir and Jinzhong Mountain reservoir the safety regulating storage reservoir. Water from Banqiao River, Shiqiao River, Xintianhe Reservoir, Tabizi Dragon pool, the east and west brunches of Qingshui River, Enze River and Luobai River will be diverted into Qingshuihai Reservoir. Qingshuihai Reservoir can supply water for industrial use and domestic use in Chenggong, the news urban area of Kunming city. This project will be completed in two stages. The first stage started from November 1, 2007 and will last for four years. After the construction in this stage is completed, the project will supply 104 Mm3 of water. The sources and routes of the water conveyance are in Xundian County and Songming County and the length of all the routes is 63.18 km.

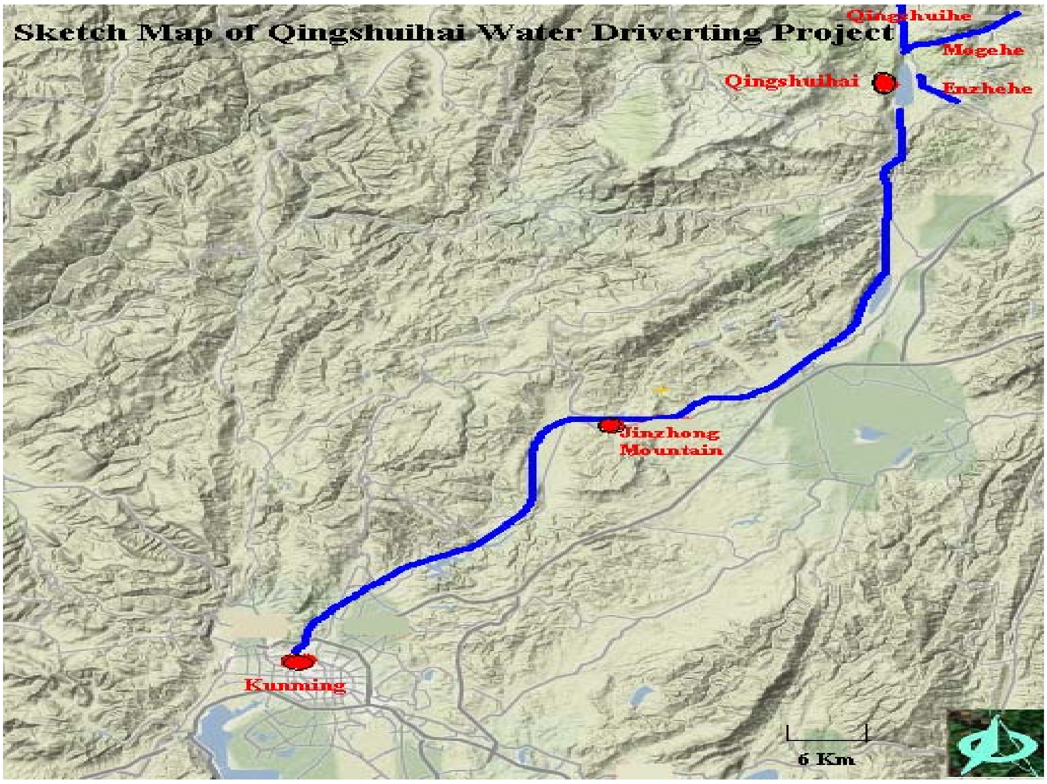

Figure 5: The Qingshuihai water diversion project

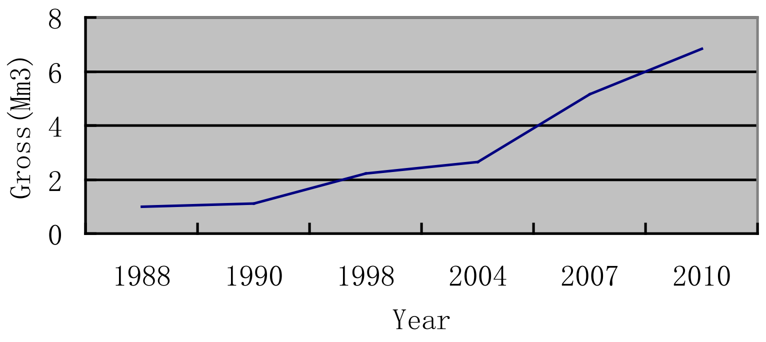

Figure 6: the increase supply water to Kunming

Data source: Statistics Bureau of Kunming municipality

In August of 1981, protection of water sources was initiated. The protection zone of Songhuaba water source was established after government of Yunnan province approved. It is a prefecture-level protection zone and is the first protection zone of drinking water sources in China. And in 1989, the municipal government promulgated the *Regulations for Administration of Protection Zone of Songhuaba Water Sources of Kunming Municipality*. In May of 2005, the Municipal Commission of Protection Zone of Key Water Sources was established. It is in charge of the comprehensive management of protection zones of Songhuaba water source and other sources. In August of 2005, the zone of water sources of Songhuaba reservoir was placed by the Ministry of Water Sources in the list of China's ten reservoir zones of water sources of cities.

The operation of urban water infrastructure opens windows of opportunity for private investment. In order to use private funds and to improve water-supply technologies and water management, on May [t], 2006, the municipal government sold 49% of the shares of Kunming Tape Water Company to the Kunming Investment Co. LTD. of Veolia Water of France. Kunming CGE Water Supply Co., LTD. was established as joint venture responsible for the operation, management and development of the water supply of the city of Kunming. It has 10 water treatment stations and can supply 1.515 Mm3 of water per day for 2.2 million people. The municipal government requires that the water supply company shall at regular intervals submit reports on operation of facilities and relevant data to the administrative department for water supply. It also shall strengthen the system of checking and reporting on water quality to ensure that supply water meets national standard. The operation must accept supervisions of administrative departments on water supply, health and quality. The administrative department for water supply shall enhance the management and examination of the water quality, and the quality information shall be made public every month. Meanwhile, the water price shall be fixed in accordance with the principles of supply cost recovery, gaining reasonable benefits, saving water and fair sharing of the cost.

The municipal government also encourages strengthening emergency measures to water supply and use of advanced technologies and facilities. It is required by the municipal government that the water-supply operation shall maintain the secure, continual and steady water supply, and shall not stop supplying water without authorization. In order to protect the living right of people, the government emphasizes that when normal water supply is affected by natural disasters and unexpected incidences, they shall adopt necessary water-distribution and engineering measures to guarantee the water supply for domestic use of residents. If the municipal government approves, the administrative department for water resources can make decisions of temporary limitation of water supply and the decisions shall be disseminated to the public. The municipal government prescribes that attention shall first be paid to satisfying the need of residents in their daily lives, while taking into consideration the need of water in industry etc. Meanwhile, it gives rewards to organizations and individuals who make contributions to saving water.

4. Songhuaba Water Resources Allocation

4.1 Panlong River

Panlong River is an important water source to Kunming. It originates from Liangwang Mountain, in north of Kunming. In its upper reach, there are two branches, Shaodian River in the west and Muyang River in the east, which meet at Chahezui of the Songhua Town. And after the junction, it is called Panlong River, the largest river flowing into Dianchi Lake. It has a length of 95.3 kilometers, of which the main stream is 46.4 kilometers. The watershed area of Panlong River is 761 km2 and the catchment area of Songhua Reservoir is 593 km2. After Songhuaba reservoir, Panlong River runs into the wide and flat Dianchi basin where the city of Kunming is located. The rainfall distribution in Kunming is uneven in a year due to monsoon. It is the rainy season during June to October. The river has an annual average runoff of 213 Mm3 and was a major flood threat to Kunming. According to the historical records, during the 714 years from 1274 (the tenth year of Xianchun of Song Dynasty) to 1988, there were 44 floods. However, from November to May of the next year, rainfall is less and the runoff of Panlong River drops in volume.

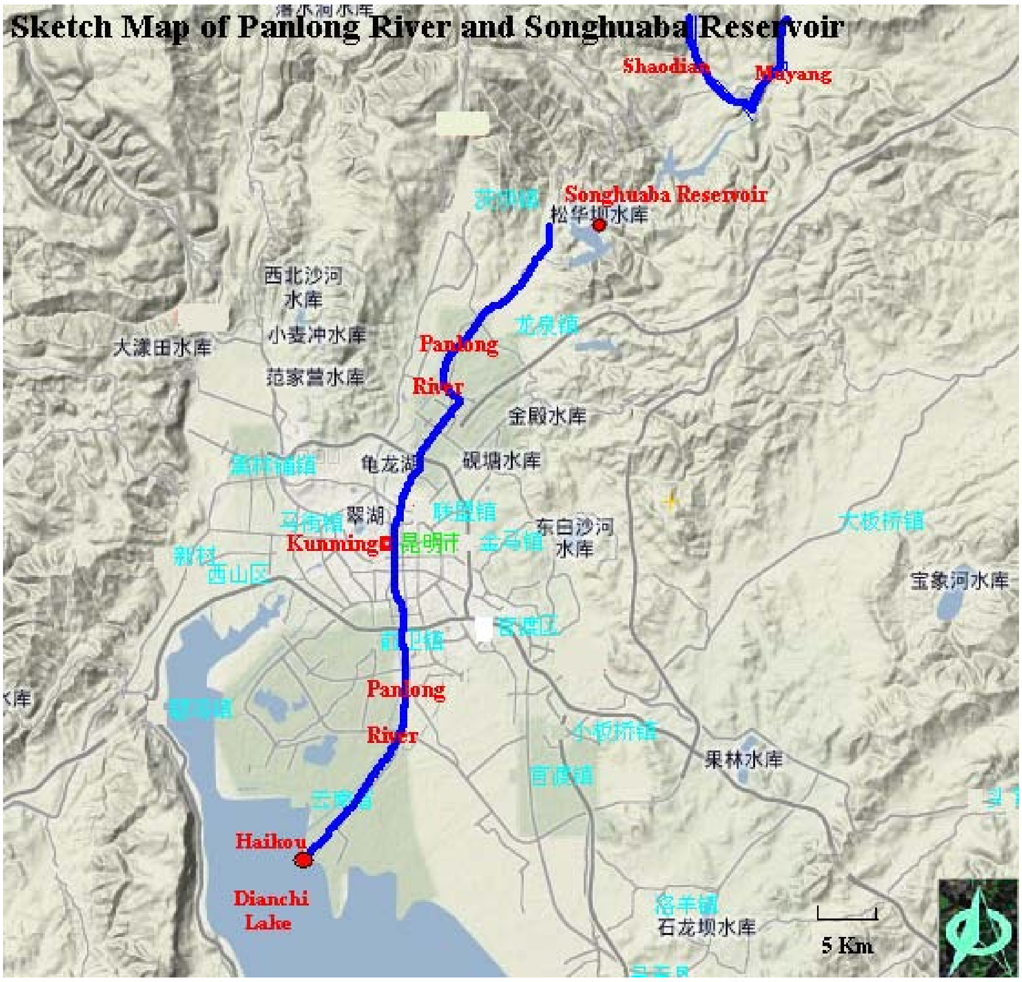

Figure 7: The Panlong River and Songhuaba Reservoir

According to the historical data, the earliest development and utilization of Panlong River was in Han Dynasty, more than 2,000 years ago. At that time, people dug canals to divert water from Panlong River for irrigation. Dali kingdom at the time of Song Dynasty dug Jinzhi Canal in order to irrigate more than 100,000 *mu* (6667 hectares) of farmland. Jinzhi Canal was diverted water from Panlong River for irrigation and also reduced the runoff of Panlong River when floods came. In Yuan Dynasty, in order to prevent floods by water control and to bring more farmland under irrigation, Saiyid Ajall Shamsal-Dn the manager of governmental affairs and Zhang Lidao the agricultural promoter built the bifurcation gate of earth and wooden structure at Songhuaba to divert water from Panlong River to Jinzhi Canal, and they also dug Haikou Canal. When the bifurcation gate was built, water was stored in the raining season and was used for irrigation in case of drought, which promoted agricultural development. In 1946, Guchang dam was built at Qincaichong in the upper reaches 7 km away from Songhuaba. It could hold 2.2 Mm3 of water for the irrigation of 40,000 *mu* of farmland.

4.2 Construction of Songhuaba Reservoir in 1959

Songhuaba reservoir lies to the northeast of Hailongtan Spring in the northern suburb of Kunming, 15 kilometers away from the town. The dam is located between

Fengling ridge and Pengfeng Peak of Songhua Mountain, is 62 meters high and has a capacity of 219 Mm3.

In 1949 when People's Republic of China was founded, water for agricultural irrigation was taken mainly from small reservoirs and rivers. From the end of 1957 to 1960, the first nationwide upsurge of water conservancy construction was set off. The water conservancy construction was a part of the strategic deployment of national construction and its purpose was to resume and develop agriculture which had been ruined in years of wars. At that time, building reservoirs was an important part of water conservancy construction or a political movement. Meanwhile, because the altitude of the upper reaches of Panlong River was 20 meters higher than that of the Kunming city, flood disasters often took place during the raining season. From November to May of the next year, the rainfall in Kunming was small and runoff of Panlong River dropped, which tended to cause drought in the lower reaches and affected the irrigation in spring. Thus, in January of 1958, Kunming Municipal CPC Committee decided to build the Songhuaba Reservoir and control floods. At that time, because of shortages of funds and materials, the government mobilized the masses to participate in the construction. Fees and labor services were shared out among villages around the reservoir according to their distances from the reservoir and the benefits they might have from the reservoir. In addition, the government was donated money from those villages which did not benefit from the reservoir, businesses and collective enterprises, and appealed for donations from society, and called for cadres, workers, students and urban residents to take part in the construction. However, in the years of the Great Leap Forward, local governments followed the policy of achieving greater, faster, better and more economical results and placed undue emphasis on results and speed. Thus "construct while benefiting" was adopted as the policy in Songhuaba Reservoir construction. On March 25, 1958 the construction started and on May 1 of the same year, the dam reached 24 meters with the capacity of 10 Mm3. On July 9, 1959 the backfill and 58% of the spillway were completed. On August 1 of the same year, the Headquarters held the completion ceremony. It is estimated that the costs amounted to CHY2.602 millions. The original Guchang dam was submerged. The Songhuaba Reservoir became the largest among the medium-sized water conservancy projects in Kunming.

According to incomplete statistic data, 1,000 local residents were reallocated without proper compensation. Villages around the reservoir were asked to help resettlement. Each village had a quota to receive a certain number of affected people. Kunming Municipal People's Government also established a factory to provide jobs for affected people. At that time, the reservoir construction and relocation were orders that residents had to follow. The resettlement was not properly dealt with and left some problems behind.

4.3 Establishment of Watershed Protection in 1981

Songhuaba Reservoir is the most important water source of Kunming. In 1949 when People's Republic of China was founded, potable water sources to Kunming were mainly springs. Since 1960, Songhuaba Reservoir and other reservoirs have become potable water sources to Kunming. Songhuaba Reservoir has often been referred as ‘a bowl of water on the top of the head’ of Kunming. Because of its large capacity, higher altitude and close distance to the city, Songhuaba Reservoir plays a strategic role. In August of 1981 Songhuaba Watershed was established as a protective area of potable water source. It is a municipal-level protected area and the very first protected area for drinking water source in China. The protected watershed has an area of 629.8 km2 and consists of five towns, including Dianyuan town and Aziying town of Songming County, and Songhua town, Longquanjie administrative community of Wuhua District and Shuanglong town of Panlong District. There is a population of 82,600 in 325 villages, of which rural population accounts for 79,800.

After the establishment of the protected watershed, the municipal government has enacted regulations such as Regulations for Administration of Protection Watershed of Water Source and System of Songhuaba Reservoir of Kunming Municipality in 1982, Regulations for Administration of Protection Watershed of Songhuaba Water Source of Kunming Municipality in 1989 and Rules for Protection of Songhuaba Reservoir of Kunming Municipality in 2006. According to these regulations, industrial development in the protected area shall be restricted, especially industries of chemicals, pesticides, electroplating, papermaking, tanning leather, printing and dyeing, asbestos and sulfur. Use of phosphate fertilizer shall be banned. Grazing shall be forbidden within the area 200 meters higher than the normal water storage level. Tobacco growing and baking shall be controlled. Construction of entertainment facilities around the reservoir shall be regulated. Entry of vehicles and tourists shall be restricted. Thus, people in the protected areas can only engage in agricultural and not-harmful sectors. These limitations constrain economic development of the protected area and living standards enhancement. Agricultural income is 60% of their total income. In 2004, the net income of the rural in the protected area was about CHY1,742 and was CHY839 less than CHY2,581 of average income in rural areas of Kunming.

Residents in the protected watershed have to intensively farm due to the lack of other livelihoods alternatives. Heavy use of fertilizers and pesticide is common. There were no facilities to treat domestic wastes discharged by residents. After 1991, the water environment and water quality had been deteriorating. In 1996, the water quality in part of the reservoir fell to Grade Four, which means not suitable to human consumption and the urban water supply was threatened. To combat environment degradation, government has intensified efforts to protect the environment and paid farmers more financial support. Firstly, it has strengthened the construction of agricultural infrastructure. Over 1,500 small-sized water infrastructure projects were completed, which has guaranteed the agricultural irrigation in the protect watershed. Secondly, over 400,000 cubic meters of waste in the reservoir was dredged in order to increase self-purification capacity. Thirdly, 173 km^2 of land has been afforested and 33 km2 of farmland has been converted to forestry for environment improvement. Fourthly, in order to manage, supervise and remove pollutant sources around the reservoir, the government has established 5 management stations and closed down 3 quarrying areas, 11 quarrying points and 23 water-washing sites. Other facilities like house-based restaurants and other entertainment facilities were closed. Unnecessary traffic was highly controlled around the reservoir. Fifthly, every year, the government invests CHY50 millions to protect Songhuaba Watershed for the water sourse and improving drinking water quality. Sixthly, in order to motivate farmers' interest in crop and tree planting, to restrict the use of chemical fertilizers and to reduce pollution from agriculture, the government has been subsidizing production and life in The Protection Watershed from the late half of 2005 onward. Because they are restricted by the policies of the government, people within the watershed are sacrificed for the water supply of 2.2 million residents in the city, and their economical development and living standard are low. In 1992, after the expansion of the reservoir was completed, its role in water supply became more important and could not be substituted. In the process of protecting water sources, the government has gradually paid attention to people's living conditions and interests and has increased financial subsidies. These policies included hillsides closed to natural regeneration, farmers subsidized for gas use and organic fertilizer, organic agriculture encouraged and waste properly managed. In 2002, the protection of Songhuaba water source was put into priority of 10 government agenda and CHY7.9 million was allocated for the watershed protection.

4.4 Expansion in 1989

By 1988, the population in the city was about 1.5 million and required a water supply of 100 Mm3. The annual inflow from the upper reaches of Panlong River was 210 Mm3 and the capacity of Songhuaba reservoir was only 70 Mm3. According to a study result, the water source was not fully used. The current reservoir could not properly control historic large floods. It was also argued that when the reservoir built in 1957, the government had made decision to develop Panlong River in different phases according to needs. It was also found that the dam had safety problems. Construction of the dam was undertaken during the period of Great Leap Forward. Limited technology and financial support led to potential defects. From 1959 to 1987, the Bureau of Water Resources continuously maintained the dam by the construction of accessory facilities, digging flood-discharge tunnels, strengthening the dam, extending spillways, extending the wave wall of the dam, dredging special spillways and building highways for emergency, and consolidating water tunnels. The Bureau made efforts to guarantee the safety of the reservoir and submitted several times to the municipal government the report on perfecting the construction of accessory facilities and extending the reservoir.

In 1976, the Kunming Municipal Bureau of Water Resources contracted to Yunnan Inventory and Design Institute of Water Resources to undertake pre-feasibility study whole watershed of Panlong River. In 1978, the finished report proposal two suggestions. One was to expend Songhuaba reservoir and another was to build Huangshiyan reservoir. In 1982, the feasibility study report on the expansion of

Songhuaba reservoir and the construction of Huangshiyan reservoir were finished. Because Songhuaba reservoir had potential safety risk, the removal of the risk had to be done in a short period, and because the proposed Huangshiyan reservoirs was not good for civil work, on 29 December 1982, the Kunming Municipal People's Government and the Water Resources Department of Yunnan Province made the decision to expand Songhuaba reservoir.

In 1983, the Kunming Municipal People's Government and the Water Resources Department of Yunnan Province jointly submitted proposal for Expansion of Songhuaba Reservoir to the National Commission of Reform and Development. In the proposal, it was stated that Kunming, downstream of the reservoir was the industrial center in central Yunnan province and its flood control standards both of the reservoir and of Kunming didn't meet the requirements of national standards. The Ministry of Water Resources fully supported that Songhuaba reservoir shall be consolidated in a short period. In 1983, they jointly submitted to the State Planning Commission the report on the expansion of Songhuaba reservoir and it was approved. In April of 1985, undertook the survey and design of the expansion of Songhuaba reservoir. The preliminary design was finished in September of 1986 by Yunnan Inventory and Design Institute of Water Resources. In 1987, the Water Resources Department of Yunnan Province submitted a proposal to the People's Government of Yunnan Province to approve the project of Songhuaba Reservoir expansion in the list of ten key construction projects of Yunnan province in 1988 and it was approved. In the same year, upon the approval of the Ministry of Water Resources, the project of Songhuaba reservoir expansion was placed in the list of state plans.

In preparation for the Songhuaba Reservoir expansion, the Ministry of Water Resources provided the financial support. It was estimated at that time that the construction would cost CHY61.13 million. On March 28th, 1987, Yang Zhenghuai, vice minister of Ministry of Water Resources made it clear in his speech that the Ministry could provide CHY20 million for the expansion when he came to Kunming to make inspections and gave instructions on water conservancy. In June of 1987 when Li Zhengyou, vice governor of Yunnan province reported in Beijing for the Songhuaba Reservoir expansion to Lu Youmei, vice minister of Ministry of Water Resources, Lu said that the Ministry could support CHY23 million which would be allocated by twice or three times. The People's Government of Yunnan Province and the Kunming Municipal People's Government shared the rest of CHY38.13 million with 50% each respectively. In 1988, the Reform and Development Commission of Yunnan Province placed the project of Songhuaba Reservoir expansion in the list of key construction projects of Yunnan province. The Songhuaba Reservoir expansion started. According to the design, the dam would be raised by 14.7 meters higher with capacity to store 219 Mm3. Table 4 provides more in formation. The expansion was started in March of 1989 and completed in 1992.

Table 4: Songhuaba Reservoir before and after the Expansion

	Total capacity (million m^3)	Normal capacity (million m^3)	Altitude of the dam (meter)	Height of the dam (meter)	Normal storage level (meter)
Pre-expansion	70	46.75	1961.3	47.3	1954
Post-expansion	219	110	1976	62	1964

Source: the Local Chronicles of Kunming Municipal (the second part)

In the expansion, 2,673 mu of farmland was submerged and 5,606 people were resettled. It was also decided that after the expansion, the reservoir was mainly used for supply water for the city. Water for irrigation was pumped from Dianchi Lake. Thus the government implemented an integrated water distribution plan of Songhuaba Reservoir and Dianchi Lake, which costs CHY134 million. According to this plan, five-stage pump irrigation infrastructure would be built along Panlong River to pump water from Dianchi Lake for irrigation. People from the inundated area were resettled outside the reservoir area. The government would allocate land for them to build houses, compensated them for the building and their losses. Farmland would be provided accordingly.

Since 2002, the daily water supply of Songhuaba reservoir is 450,000 cubic meters, accounting for 50% of the total water supply to Kunming city. Songhuaba reservoir is also a flood control device. The water from Songhuaba was not used for irrigation but only for domestic use. Instead, the water for irrigation was pumped from Dianchi Lake by a five-stage pump irrigation infrastructure. Government had to pay for operation costs. Since 1999 the urbanization took most of farmland and irrigation did not function anymore.

4.5 Water Price Adjustments

Water pricing is another means that government undertakes macro-control on water demand. Kunming Municipal People's Government has held four times of water price hearings.

On December 18th, 2001, the first hearing on water price raising was held. The price department of Kunming invited deputies from the Kunming Municipal People's Congress, Kunming Municipal CPPCC Committee, Labor Union and Customers' Association, and customers, relevant technical and economical experts to attend the hearing. In that hearing, it was planned that the water price would be raised, and the price standard would be set for water in special use like sauna, entertainment and car washing. At that time, the fee of tap water was CHY1.20 a cubic meter including CHY0.85 for water charge and CHY0.35 for sewage treatment charge. According to Kunming Water Supply Corporation and Kunming Sewage Company, the fee was moderate and relatively low in China. If the charge of sewage treatment remained unchanged, the Sewage Company could only maintain the operations of existing sewage treatment plants and drainage networks and had no fund for maintenance, innovation and depreciation of equipments and pay for loan and interest from World Bank. After discussion, the hearing presented the preliminary examination opinions: to further regulate the price of domestic water use of residents, to raise significantly the charge for groundwater usage, for special sector of water use like sauna, entertainment and car washing.

On November 8th, 2005, the Development and Reform Commission of Yunnan Province and the Kunming Municipal Commission of Development and Reform jointly held a hearing on water price adjustment. 25 representatives from deputies of the Kunming Municipal People's Congress, members of the Kunming Municipal CPPCC Committee, experts, scholars, operators, employees of enterprises and community residents attended the hearing. At the hearing, Li Jinhua the vice director of the municipal Bureau of Water Resources put forward the suggestion for raising price and said that it was necessary to raise funds through rational price adjustment to develop and protect water resources. Jin Zuxin the chairman of the board of directors of Kunming Dianchi Investment Co., Ltd. said that if the charge for sewage treatment could be raised, the company could make financial surplus that serve its debt, improve equipment and properly treat sewage. Zhu Zhi the chairman of the board of directors of Kunming Water Supply Group said that because of the high cost and low price of tap water, the more water the company supplied, the more loss it got. He also argued that increasing water price can promote the rational use of water, water conservation and the sustainable utilization of water resources.

In addition, in the first half of 2007 and the first half of 2009, the municipal administrative department for price held two hearings on raising water price. The plan to raise water price for the reason of loan repayment on July 1st, 2007 was aborted because it was not approved. On May 20th, 2009, the Development and Reform Commission of Kunming issued a public notice of raising water price on June 1st.

5. Conclusions

Kunming is one of 14 cities that suffer severe water shortages. Songhuaba Reservoir is one of its most important sources of tap water. The case study on Songhuaba Reservoir presents water demand and supply of Kunming and the management of water resources allocation.

Firstly, In China, water is a public resource, which is owned by the state and managed by its line agency according to integrated plans within river basin and administrative boundary. The government sets up the principle of allocation of water resources by making relevant laws and regulations, guides the development and utilization of water resources by making annual development plans, medium- and long-term plans and strategies, guides and supervises the development and utilization of water resources by examining and approving projects of development and utilization, and promotes water conservation by setting quotas for water use, specifying measures of rewards and punishments and adjusting water price. While the government is the most important actor in allocation and development of water resources, other actors like tap water companies, consulting companies like institutes of inventory and design, scholars and media also play roles. Tap-water companies are responsible for supplying water for cities. Faced with the growing requirements of urban residents on water demand and quality, they can assist the government to prioritize sources of tap water. In order to lower the cost of water supply and improve the water quality, they can resort to the government in the adjustment of water price. In addition, consulting companies and scholars by their studies results can influence or promote the decision of the government. Public opinions can be transferred to decision makers through channels. Media, by presenting various actors opinions can also influence the decision.

Secondly, the water resources shall be developed according to certain procedures. Usually the government is the investor of projects of water resources development and utilization. The projects must be in line with relevant laws and regulations. In Kunming, Peoples' Conference, Peoples' Political Consultation and Tap Water Company, or Water Resource Bureau can propose water resources development projects. Tap Water Company can contract the pre-feasibility study to licensed consulting companies and submit project proposals to Bureau of Water Resources and the Development and Reform Commission of Kunming. And the project proposals examined and approved by the Bureau and Commission shall be submitted to the municipal government and the municipal CPC committee for further examination and approval. After project approval, either tap water company or water resource bureau contracts to consulting company to undertake the feasibility study and design of the projects. And project of which the design meets the standard will be placed in the annual management plan of investment for unified arrangement.

Thirdly, according to the *Water Law of People's Republic of China*, domestic water use shall be first taken into account. So the domestic water is given priority in Kunming when there are conflicts among water for industrial use, domestic use and for agriculture. When domestic use is guaranteed, the government allocates the water for industrial production and for agricultural irrigation. Government also seeks alternatives to requirements of industry and agriculture.

Fourthly, in Kunming, limited water sources are mainly used for domestic use. It is costly for industry to use water. Water price for domestic use is the lowest comparing with water price for industry. The government policy requires that industries shall improve ratio of using recycled water and treat their waste water. This increases the water use costs of industry. Farming irrigation is partially dependent on groundwater pumping or diversion of Daichi water. Farmers do not need to pay for water use but for water pumping. Recent development of converting farmland into urban use decreased diversion of Diachi Lake Water to irrigation.

Fifthly, as the society and economy develop in Kunming, water demand grows larger. And this is the most important objective factor which influences the allocation and management of water resources of Kunming. Since the reform and opening up in 1978, the economy of Kunming has achieved steady development and city proper has been enlarged. And as the population grows, the groundwater can not meet the need of domestic use of urban residents and the government has to find other water resources outside the city. For example, Songhuaba Reservoir was originally used for supplying water for irrigation but now is used for supplying domestic water for urban residents.

Sixthly, because of the water pollution, Kunming City has to rely on the existing water resources and on the diversion of water across basins. Dianchi Lake was one of the important sources of Kunming with a capacity is 750 Mm3. The water demand of Kunming could have been met by Dianchi Lake. However, since the Since 2001 Dianchi Lake has been abandoned as a source to domestic use because of water pollution. Meanwhile, the limited groundwater resource has been threatened by pollution. Thus Kunming had to find other water resources outside city and divert water to Kunming from other basins. The sources of current water-supply mode of the “six reservoirs and one station” are outside the city.

Seventhly, the government has established the protective watersheds around Kunming, which restricts the economical development within the protective watersheds. The existing compensation mechanism is imperfect and effective to protect water sources. Within protected watersheds, limited development of industries and services force local people intensive agricultural production. Their income is lower than that of farmers outside of the protected watershed. The government’s financial compensation and support are insufficient. Meanwhile, because of the rapid growth of population in the protected watersheds, increase domestic waste and sewage may threat water quality. The irrational use of chemical fertilizers and insecticides, deforestation and overgrazing also affect the environment and water quality.

Eighthly, recognizing scarcity of water sources, government pays more attention to water conservation. Government takes measures to conserve water use. These measures include differentiating water prices, implementing the system of water permit, rewarding these units and individuals who make outstanding achievements in water saving and penalizing those who waste water. Meanwhile, the government popularizes water-saving policies, increases the urban residents’ awareness of saving water, and improves and promotes water-saving technologies and products.

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PN67_2010_03

Hydrological and water resources modelling in the Mekong River Basin: Current status, major gaps and opportunities

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Introduction

Water Resources in the Mekong River basin today are facing rapid development particularly in China, Laos, Vietnam and Cambodia. Hydropower development is the most remarkable and its impacts will be potentially felt by all other water uses in the Basin. Simulation models may assess such impacts.

There have been various modelling activities in the Mekong during the past years. The hydrological models have been developed and applied in basin-wide scale (Kite 2001; ADB 2004; World Bank 2004; Costa-Cabral et al. 2007; MRCS/BDP2 2009b), and more local scale (MRCS/WUP-FIN 2007; Thanapakpawin et al. 2007; Veijalainen, Kummu, and Lauri 2007). The other large modelling entities are the hydrodynamic models applied to mainly to the floodplains in Cambodia and Lao PDR (Fuji et al. 2003; MRCS/WUP-FIN 2003; ADB 2004; World Bank 2004; Kummu et al. 2006; MRCS/WUP-FIN 2007), and economic and policy models (Ringler 2001; Rowcroft 2005; Ringler and Cai 2006; Varis and Keskinen 2006; Dung et al. 2009).

In this paper we aim to give an overview of the modelling activities in the Mekong basin with a particular attention to the modelling activities to the ones used for basin-wide impact assessment. The paper further aim to identify the major gaps in the modelling activities and to analyse the challenges that hydrological modelling faces in the basin and identifies opportunities that emerge from such challenges.

The paper gives also a brief introduction to the recent development activities and plans in the basin. We also attempt to give state of the art syntheses on the macro level water allocation issues by identifying the main development activities in the Mekong and reviewing how those will impact on hydrology in different spatio-temporal scales.

The paper has been written as a part of Challenge Programme on Food and Water (CPWF) project "Improving Mekong Water Allocation" (PN 67), funded by CPWF, IFAD (International Fund for Agricultural Development) and EC (European Commission). The project aims to analyse under what conditions, and via what political drivers, do selected 'progressive' processes and tools reduce the severity of disputes over, and improve the fairness of, water allocation in the Mekong Region (Dore 2008). The allocation has been defined in the project as "*formal and informal decision processes (and non-decisions) that alter the physical distribution of water, and water-related rewards, risks, rights and responsibilities (4Rs)*" (Dore 2008).

Modelling is one of very few tools able to assess impacts at multiple spatio-temporal scales, and across a range of disciplines. It thus plays an important role in the impact assessment process and potentially, therefore, in the decision processes. Hydrological and water resources modelling was thus selected to be among the analysed tools in the PN67 that have been used directly or indirectly for decision processes in the Mekong.

2 Hydrology and water resources development in the Mekong Basin

2.1. Mekong Hydrology: Brief synopsis

The Mekong is the largest river in South East Asia (Figure 1), share by 6 countries, with a basin area of 816×10^3 km^{2,} (Kummu 2008), estimated long-term mean annual runoff of 475 km^3 (Mekong River Commission 2003; 2005) and population of 70 million people (Mekong River Commission 2003).


90°E
100°E
110°E
Chengdu
Lhasa
Thimbu
BHUTAN
CHINA
INDIA
Irrawaddy
Kunming
ANGLADESH
Dhaka
Mandalay
Red River
Hanoi
MYANMAR
Salween
LAOS
Vientiane
Chao Phraya
Rangoon
Mekong
THAILAND
Bangkok
Andaman Sea
CAMBODIA
Phnom Penh
VIETNAM
Ho Chi Minh City
Legend
Country boundary
Large River Basins
Intermediate River Basins
SE Asia Mainland
Gulf of Thailand
South China Sea
500
km
INDONESIA
MALAYSIA


100°0'0"E
110°0'0"E
30°0'0"N
INDIA
CHINA
MYANMAR
VIETNAM
HANOI
Chiang Saen
Luang Prabang
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LAO PDR
VIENTIANE
Mekong River
THAILAND
Mukdahan
Pakse
BANGKOK
CAMBODIA
Tonle Sap Lake
Kratie
PHNOM PENH
Legend
Country boundary
Upper Mekong Basin
Lower Mekong Basin
Gulf of Thailand
Ho Chi Minh City
10°0'0"N
500
km
South China Sea

Figure 1. The mainland Southeast Asia and major river basins of it (left) and Map of the Mekong Basin; Lower Mekong Basin and Upper Mekong Basin are separated with different tones of grey (right) (modified from Kummu 2008).

The climate in the Mekong Basin varies from tropical to temperate. On the Tibetan plateau the high peaks are permanently snow-capped, while most of the lower basin is tropical. Part of the dry season flow and the rise to the wet season stage come from snowmelt. In the lower parts of the basin, the climate is seasonal. Between November and February the Northeast Monsoon brings dryness and cooler temperatures, while the Southwest Monsoon dominates the hot wet season from June to September.

The tributaries in central and southern Laos are the most important contributors to the Mekong's flow in the lower basin (Mekong River Commission 2005). Although only 16% of the total discharge originates from the upper Mekong Basin (UMB) it is important part of the basin as 35% of the spring flow and over 55% of the sediment flux originates from there (Kummu and Varis 2007).

The hydrology of the Mekong is dominated by the annual flood pulse (Mekong River Commission 2005). The flood pulse concept (Junk 1997) has been widely accepted as describing the highly productive floodplain environments and the ecology of pulsing systems in the Mekong as well. Therefore, from ecosystem productivity point of view, it is highly important to maintain the natural hydrological pattern of the Mekong River (Kummu and Sarkkula 2008). The Cambodian floodplains and the Mekong Delta are among the most productive ecosystems in the Mekong. They receive more than 90% of the available water resources and 95% of the total suspended sediment flux from upstream. This part of the basin is thus directly dependent on the conditions of the Upper Mekong, and therefore vulnerable for any changes in flow or sediment flux due to the upstream development (Kummu and Sarkkula 2008).

2.2 Recent Development plans in the Mekong Basin

The Mekong River is one of the world's most diverse river ecosystems, and one of the few large rivers globally whose flow has not yet been drastically modified by human development (Mekong River Commission 2005). However, the Mekong region is experiencing rapid population growth and economic development, with associated increase in demand for and development including:

- Construction of dams and reservoirs for hydropower or irrigation
- Withdrawals for irrigation, domestic and industrial use
- Deforestation and other land use changes (including urbanization)
- Inter- and intra-basin diversions
- Construction of roads, embankments, levees and bank protection works

Significant water-related infrastructure has already been built (Figure 1), or is under construction, in major tributaries and upper reaches of the mainstream (King, Bird, and Haas 2007; Mekong River Commission 2008a). There are increasing concerns about the impact that further development will have, both on the availability and quality of water for downstream users; and on the riverine and floodplain ecosystems that sustain the Mekong's highly productive fisheries and contribute to the livelihoods of millions of subsistence and semi-subsistence users. The transboundary nature of the river, running through six countries (China, Myanmar, Lao PDR, Thailand, Cambodia and Vietnam), adds an extra dimension of complexity to the debate about equitable sharing of the river's resources.

A changing global climate may place additional pressure on Mekong water resources (Eastham et al. 2008; Penny 2008; TKK and SEA START RC 2009). However, based on the recent estimates, the timescale for significant change in climate is much longer than that for development (TKK and SEA START RC 2009); dams, diversions and withdrawals are likely to have much greater impact on water resources in the next 20 to 30 years than the direct effects of climate change (TKK and SEA START RC 2009).

Hydropower

It is difficult to keep track of all proposed hydropower developments in the Basin, let alone estimate their potential impacts. A recent inventory of existing and potential hydropower projects in the 6 Greater Mekong Subregion (GMS) countries came up with a total of 261 hydropower projects (King, Bird, and Haas 2007). Out of this total, at least 28 were under construction and at least a further 179 large projects identified as most probable development sites.

More recently, the Mekong River Commission (Mekong River Commission 2008a) has published a map indicating the location of different dams planned in the Basin (Figure 2). Notable in this map is that it also indicates plans for several mainstream dams in Lower Mekong Basin in both Laos and Cambodia. The storage capacity of the reservoirs may increase from around present 5 km^3 to over 100 km^3 if all the planned dams will be constructed (Figure 3).

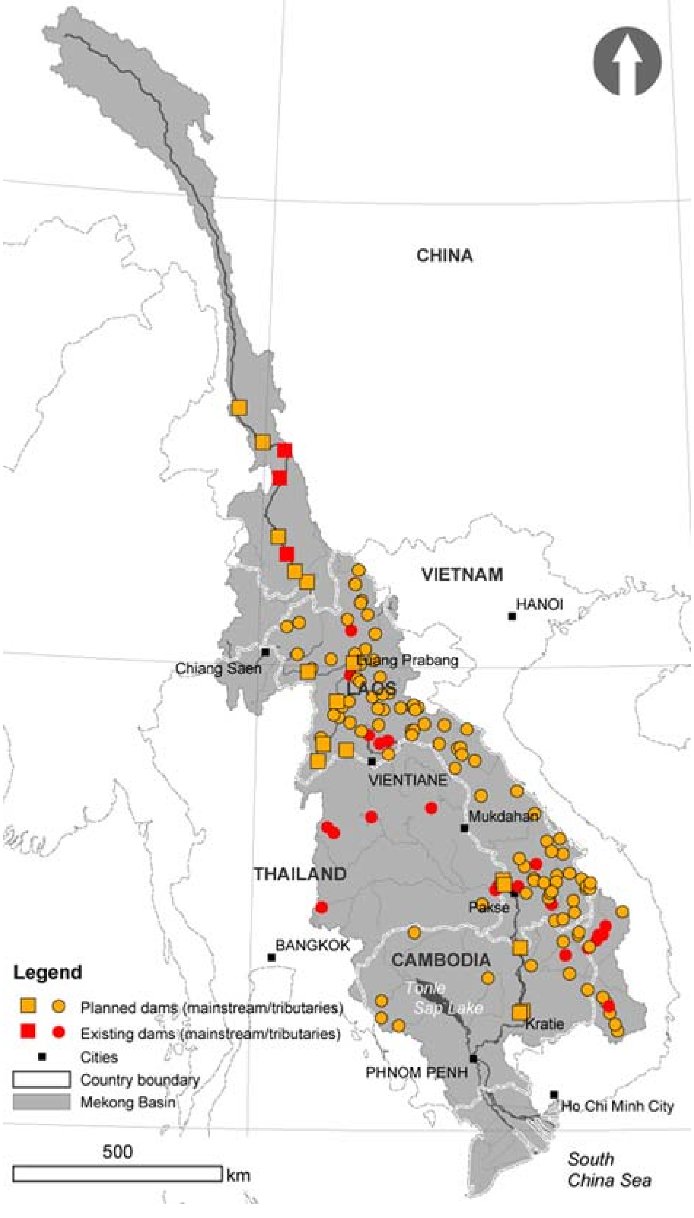

Figure 2. Existing (left) and planned & existing (right) dams in the Mekong Basin. Based on the MRC/BDP data.

The realistic potential for hydropower generation is, however, likely to be considerably lower after taking into account costs and local environmental and social factors (King, Bird, and Haas 2007). The actual cumulative downstream impacts of these developments will depend on the amount of the dams constructed as well as on their operational procedures, but the impacts are in any case most likely to be remarkable.

Table 1. Summary of the existing, on-going and proposed hydropower dams projects in six Mekong countries; figures for all dams plus those within the Mekong Basin (Mekong River Commission 2008a).

	Existing	Under construction	Planned	TOTAL
Cambodia	1	0	13	14
China	3	1	4	8
Laos	10	8	82	100
Thailand	7	0	0	7
Vietnam	7	5	2	14
	28	**14**	**101**	**143**

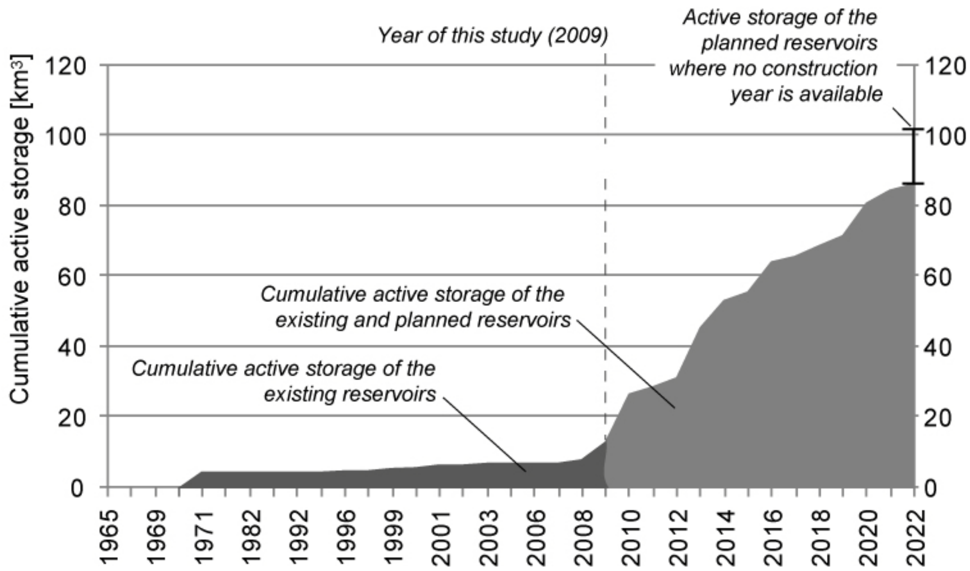

Figure 3. Cumulative storage of the existing and planned reservoirs in the Mekong Basin.

Irrigation

Diversion of surface waters for irrigation results in increased evaporation and thus, a net loss of water in the basin (Vörösmarty and Sahagian 2000). Between 1961 and 2002 the irrigated area in Mainland Southeast Asia has increased from 1.7% to 5.4% of the total land area (FAO Statistical Databases 2005) or, in other words, leaving approximately 21.8% of agricultural land irrigated. In 2002 the most heavily irrigated countries were Thailand and Vietnam where 9.0% and 9.7% of the total land area was equipped for irrigation, respectively, while in Laos the same figure is 0.7% (FAO Statistical Databases 2005).

The irrigation intensity is, however, rather low in the region compared to other parts of Asia (Barker and Molle 2004). The total land area equipped for irrigation in the entire Mekong basin in 2002 (FAO Statistical Databases 2005) was 2.9%. In the Lower Mekong Basin the irrigation ratio (irrigated area over cultivated area) is rather low in international standards, being estimated at 7-10% while the ration is e.g. for the whole Asia 45% (Mekong River Commission 1998). There are, however, significant differences in the extent of irrigation in the basin, with irrigation in the Vietnam Delta, for example, covering approximately 60% of cropland area (Mekong River Commission 2002).

Recent years have brought also new players in the field of agricultural development, among other sectors, from Arab world and also China. In Cambodia countries such as Kuwait and Qatar has announced significant investments into country's agricultural sector, to secure their own food security (Economist 2009).

Deforestation

Deforestation has for a long time received the most attention among all types of land cover change in the region. However, recently the increased hydropower construction is changing the focus towards dams and reservoirs and, partly, even overshadowing the large deforestation happening in Lao PDR (e.g. Shi 2008) and Cambodia (e.g. FAO 2006). In Thailand large forest areas have been already cleared and changed to rice fields and other agricultural lands (Nipon 1994; Douglas 1999).

The forest cover in the mainland Southeast Asia has decreased from 53.4% to 41.9% of the total area during the period of 1963-1994 (FAO Statistical Databases 2005) or an annual deforestation rate of 0.64%. At the same time agricultural area has increased from 17.4% to 24.7% during the period of 1963-2002 (FAO Statistical Databases 2005). In the Lower Mekong Basin the forest cover decreased from 36.7% to 35.9% between years 1993 and 1997 (Mekong River Commission 2003). This means that the annual deforestation rate was 0.53%. The deforestation continues to be a large issue modifying the landscape particularly in Cambodia and Lao PDR.

Interbasin water diversion

There are various plans to divert water from the Mekong Basin to Thai internal basins (Molle and Floch 2008). None of the plans have, however, materialised so far. There have been, nevertheless, water diversions lately between the Mekong tributaries (ADB 2004) within Lao PDR. The impacts of such actions might be significant in local scale, while the basin-wide impacts are not necessary significant.

Development activities: spatio-temporal scales and hydrological impacts

Scales are important in the impact assessment discipline as it often works with a variety of spatio-temporal scales on various disciplines (Kummu 2008). Scales are particularly important when a) identifying the critical processes and areas of possible consequences, b) selecting the spatio-temporal scales of the assessment, c) identifying the data needed and available, d) selecting the methodologies and tools related to the process, and e) presenting the results of the assessment to the decision-makers and planners. Kummu (2008) concludes that, instead of down-/up-scaling, a multiscale approach often appears to be a more preferable solution. A more extensive inclusion of scale issues in the impact assessment process is believed to contribute to building a more profound connection between researchers and decisions makers.

3.1. Spatial scales and hydrological impacts

Every development action presented in previous Section has a spatial scale of its own in regard to its consequences (Figure 4). The actions, such as irrigation or dam construction, are often occurring at the local or tributary scale. The impacts are, however, occurring in most of the cases at a variety of scales ranging from local to basin scale. The local impacts, taking place in the immediate vicinity of the action, can be relatively obvious, for instance, a dam reservoir flooding large areas of agriculture land and local settlements. The downstream impacts from tributary to basin scale, being either positive or negative on the environment and human beings, are usually more complex to first identify and then to assess (Kummu and Sarkkula 2008). The water related actions in the Large River Basin (LRB) context are listed in Table 2 from actions having an impact on a widest range of scales to those having an impact on a limited range of scales.

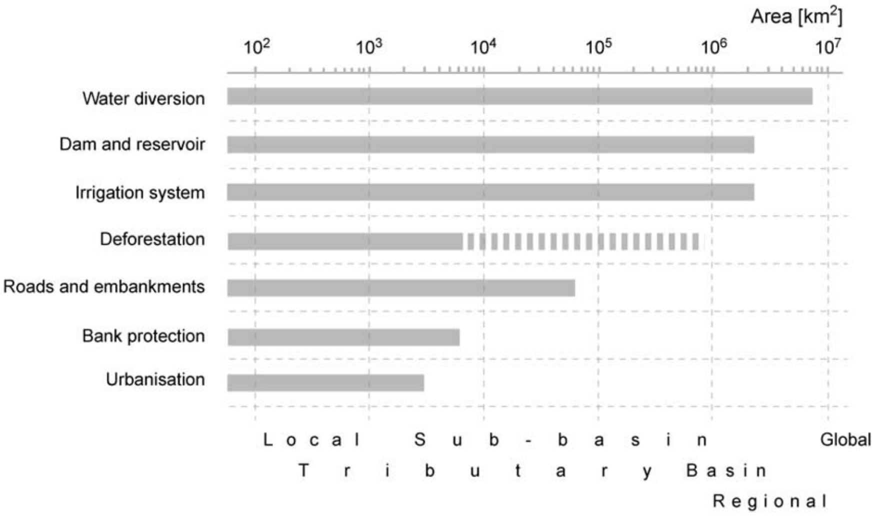

Figure 4. Spatial scales of the possible hydrological impacts due to variation of actions (note: areas smaller than 102 km2 cut off from the figure) (Kummu 2008).

Table 2. Water resources related actions in the LRB context with definition and impacts of the actions including the range of scales (Kummu 2008).

Action (scale of impacts)	***Definition***	***Hydrological Impact (HI)*** [a]
Water diversion (Local – Regional)	*The transfer of water from a stream, lake, aquifer, or other source of water by a canal, pipe, well, or other conduit to another watercourse or to the land, as in the case of an irrigation system* (Water Words Dictionary 2008).	Changes in a hydrograph in both watercourses: the one the water is transferred from and the one it is transferred to. The water diversion can occur either within the basin (e.g. between two tributaries) or between two basins. Thus, the HI may occur from local to regional scale.
Dam and reservoir construction (Local – Basin)	Refers here mainly to a construction of large dams on either tributaries or a main stream. The cumulative impact of smaller dams should not be neglected either when conducting a larger scale assessment.	Depends on many variables, such as operation of the dam, size of reservoir, height of the dam, etc. Most common impacts are changes in hydrograph, e.g. higher dry season flow and lower wet season flow due to the storing of water in a reservoir (see e.g. *Paper IV*), sudden water level fluctuations, losses in discharge due to evaporation, trapping the sediments (see e.g. Kummu, Varis, and Sarkkula 2008), etc..
Irrigation system (Local – Basin)	*The controlled application of water for agricultural purposes through man-made systems to supply water requirements not satisfied by rainfall; applying water to soil when rainfall is insufficient to maintain desirable soil moisture for plant growth* (Water Words Dictionary 2008). The intra-basin irrigation falls within water diversion activities.	Today, about 67% of the global water withdrawal and 87% of the consumptive water use (withdrawal minus return flow) is for irrigation purposes (Shiklomanov 1997). Thus, irrigation is one of the most important factors influencing water resources globally. In general, irrigation leads to decreased streamflow and increased evapotranspiration (Haddeland, Lettenmaier, and Skaugen 2006). The most remarkable impacts of irrigation on hydrology include: a) changing the flow regime by shifting the discharge pattern, b) groundwater level changes, and c) irrigation may increase evaporation. For more details, see Kummu *et al.* (2008).

Action (scale of impacts)	***Definition***	***Hydrological Impact (HI)*** [a]
Deforestation (Local – Sub-Basin /Basin)	Definitions of deforestation have been categorized into 'broad' and 'narrow' types (Wunder, 2000; cited in Mahapatr and Kant, 2005). The broad version includes forestland use conversion and forest degradation or reduction in forest quality (density and structure, ecological services, biomass stocks, species diversity etc.) while the narrow version focuses only on change in forestland use (Mahapatr and Kant 2005). The FAO uses the narrow version and defines deforestation as a 'change in land use with depletion of crown cover to less than 10%' (*ibid*).	Land-cover changes, including deforestation, and impact on total stream flow is a complicated issue, discussed by Douglas (1999) and Walker (2002), among others. Deforestation in most of the studies increases the total stream flow volume, but at the same time also changes the pattern of the flow (*Paper I*). In general, after deforestation, wet season flows grow and dry season flows decline. However, this is a generalisation, and the issue is discussed in more detail by e.g. Walker (2002) and Bruijnzeel (2004). In small watersheds (< 1,000 km^2), increases in water yield translate directly onto increases in stream-flow, and forests have great influence on flood peaks, whereas in large river basins, the link between deforestation and flooding has not been found (Bruijnzeel 2004; Enters 2005). For more details, see Kummu *et al.* (2008).
Roads and embankments (Local – Sub-basin)	Roads and embankments can be situated basically everywhere in the basin. Here the focus is on the floodplains and other areas with significant overland flow.	Roads and similar structures divert the floods normally back to the river and may increase floods in some other areas downstream as the natural storage of the river is blocked. In forested and grassland areas, roads may have major impact on the overflow (Ziegler et al. 2004). For more details, see Kummu *et al.* (2008).
Bank protection (Local – Tributary)	Bank protection is used normally for protecting the river banks from erosion in various ways, e.g. rip rap, concrete structures, natural vegetation mats, etc.	Bank protection structures along a meandering river affect channel morphology and dynamics by restricting the width of wandering belts (Xu, 1997). It may also locally change the flow velocities and reduce the suspended sediment entering the river from the banks.
Urbanisation (Local – Tributary)	Urbanisation refers here mainly to the paved non-permeability areas that change or disturb the natural hydrological cycle.	Urbanisation is spatially not a dramatic change but it often markedly changes local hydrological conditions (Bruijnzeel 2004) and has a considerably effect on some of the mass flows, e.g. nutrients, pathogens and micropollutants. For more details, see Kummu *et al.* (2008).

3.2. Temporal scales and hydrological impacts

Nature changes over time, but human actions have often significantly modified, either increased or slowed down, the rate of that change (Kummu 2008). The temporal scale is always present in such changes and should be taken into account in the IA process. Two different temporal scales can be discussed within the discipline of temporal scales: a) *assessment scale*; and b) *impact scale* (Kummu 2008). *Assessment scale* is defined to be the time frame covered by the assessment in a case predicting the consequences of a proposed action in the future. *Impact scale* can be defined to be the time frame of the proposed action(s) impacts, i.e. how long the action will have an influence on the environment. Each project within the group of actions (e.g. irrigation system) is unique and conducted in diverse ecosystems and environments. Therefore, it is nearly impossible to define the definite temporal impact scale for any of the group of actions. Additionally, even though an action would be cancelled (e.g. dam removed), only some of the impacts are restorable while others are non-restorable. It is, nevertheless, necessary to illustrate the order of magnitude of each group's impact scale (Figure 5; Table 3). The temporal impact scales of each group are then briefly discussed and commented in.

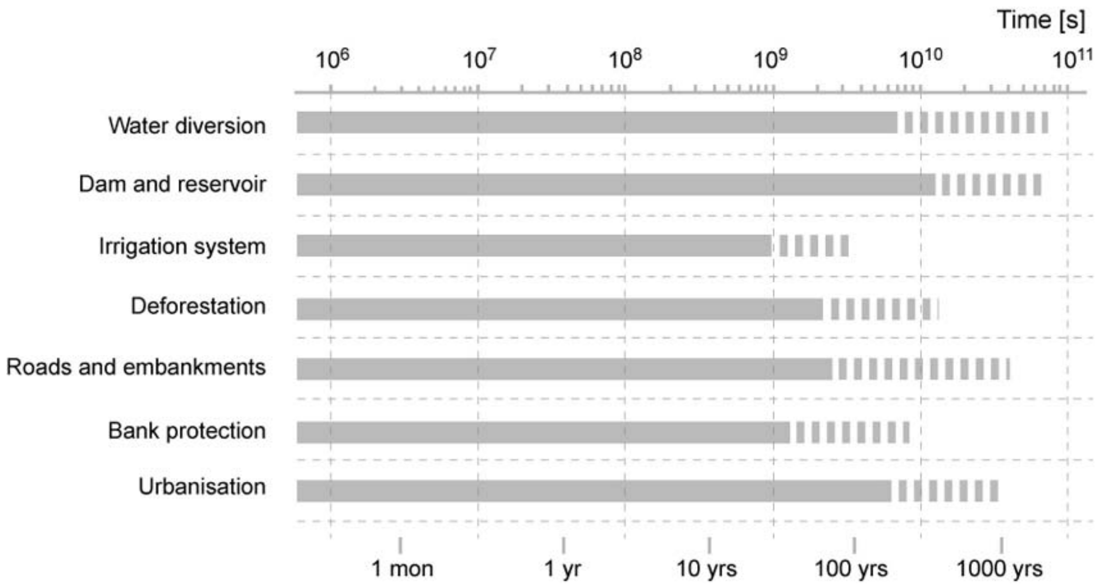

Figure 5. Temporal scales of the possible hydrological impacts due to variation of actions (Kummu 2008).

Table 3. Water resources related actions in the LRB context with definition and impacts of these actions including the range of scales (Kummu 2008).

Action	***Temporal impact scale***	***Remarks***
Water diversion	- centuries-millenniums	Impacts of a large scale water diversion project can last for a very long time, from centuries to even millenniums. The temporal impact scale depends on the spatial scale, technology used for the diversion, and other factors. An example of a rather small scale water diversion project having a long term impact is given in *Paper VI*.
Dam and reservoir construction	- centuries	Large dam project impacts have a very long life-span and may last for centuries or even more. There are, however, various dam removal projects particularly in Northern America and Europe. These kinds of projects will, naturally, shorten the timescale of the impacts. Silting up of a dam reservoir may also shorten the lifespan of a dam.
Irrigation system	- decades	Irrigation projects do not necessarily include large scale infrastructure, except the possible irrigation channels and irrigation reservoirs. Thus, depending on the type and life-time of the project, the impacts may last from a few to several decades or even centuries in a large scale project.
Deforestation	- decades-centuries	Deforestation may change the land cover for decades or centuries, depending on the new land use of the area and ecological zone.
Roads and embankments	- decades-centuries	Roads, particularly major ones, are a result of long-term planning and thus, the impacts are there for several centuries. Smaller roads and paths may impact hydrology only for some decades.
Bank protection	- decades-centuries	Depending on the bank protection method used, the impacts may last from decades to even centuries.
Urbanisation	- centuries	Urban areas, as roads, are normally planned to be there for centuries, in one way or another. Thus, the duration of the impacts is counted in terms of centuries.

3.3. Spatio-temporal scales

Each of the actions has a slightly different spatio-temporal scale form. There is, however, one unifying feature in all of them; over smaller spatial scales (local-tributary) the impacts may occur on shorter time scales (of the order of hours) while over larger spatial scales, they may occur over a longer period of time (of the order of days or weeks) (Kummu 2008). One example is operation of a dam that may lead to sudden water level fluctuations close to the dam while the impacts further downstream are happening over a longer time-span (Figure 6).

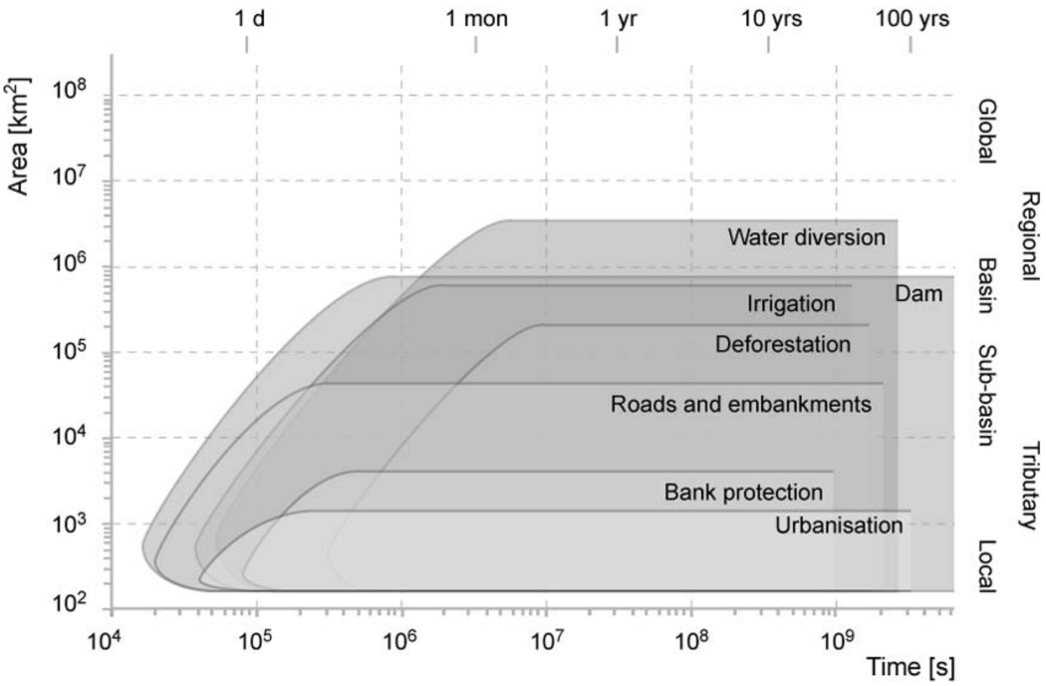

Figure 6. Spatio-temporal scales of the consequences of human actions (Kummu 2008).

Impact assessment and models

4.1. Role of modelling in impact assessment

Impact assessment can be broadly defined as *"the prediction or estimation of the consequences of a current or proposed action (project, policy, technology)"* (Vanclay and Bronstein 1995). In the context of water management in large basins, both the drivers and impacts of hydrological change act over a wide range of sectors, and of spatial and temporal scales, as briefly presented in previous Section. This results in a very complex set of interactions, with cumulative impacts across sectors and scales.

The impacts of changes due to water resources development and climate change will be felt in five main disciplinary domains, which must be approached more or less sequentially – it is not always feasible to answer questions about impacts in one until you know something about the previous one:

- Hydrological: flow volume and distribution, river water level, river connectivity, flood dynamics, water quality, sediment and nutrients
- Ecological: habitat quality, wetland functioning, fish migration, aquatic organisms
- Livelihood: water availability for agricultural and aquacultural production, availability of fish and other aquatic products, vulnerability to floods and droughts
- Economic: economic costs and benefits of different water use options
- Social: migration, gender relations, family structure, public health (nutrition, HIV/AIDS).

Coherent assessment frameworks must be developed in each of these domains in order to characterise impacts comprehensively.

Modelling is one of very few tools able to assess impacts at multiple spatio-temporal scales, and across a range of disciplines, and it therefore plays an important role in the impact assessment process (Sarkkula et al. 2007). A model is simply a representation of a system that allows for investigation of the properties of the system and, in some cases, prediction of future outcomes[1]. In the hydrological domain, models are mostly numerical simulations of natural processes, but in the social and economic domains, they may be more qualitative, conceptual descriptions of system interactions.

As Adamson (2006) points out, even within the single domain of hydrology:

> *There will never be a single integrated modelling system, a unified complex of numerical routines that can simulate hydrological processes at any prescribed spatial and temporal scale with the focus on any element of interest..... Rather, there will be a family of custom-built models, some locally specific and physically very detailed, others more generalised at the macro and basin scale.*

It is clear that a range of modelling tools will be needed in order to assess impacts comprehensively. The purpose of each model activity should be also tailored for the needs of the question at hand. Adamson (2006) discussed the trade-off between complexity, error and sensitivity on the one hand, and utility on the other (Figure 7) in selecting a model which is “fit for purpose” for a particular set of simulation and modelling objectives. He stressed the importance of finding models suited to the question and available data, and the dangers inherent in adapting or redefining the problems to suit available models or software.

Modelling across disciplinary boundaries is notoriously difficult, in part because of the different intellectual frameworks and assumptions underlying different disciplines; and in part because of differences in availability and quality of data in the different disciplinary domains. However, numerical models can be constructed linking the different domains within a system if the critical interactions can be determined and quantified.

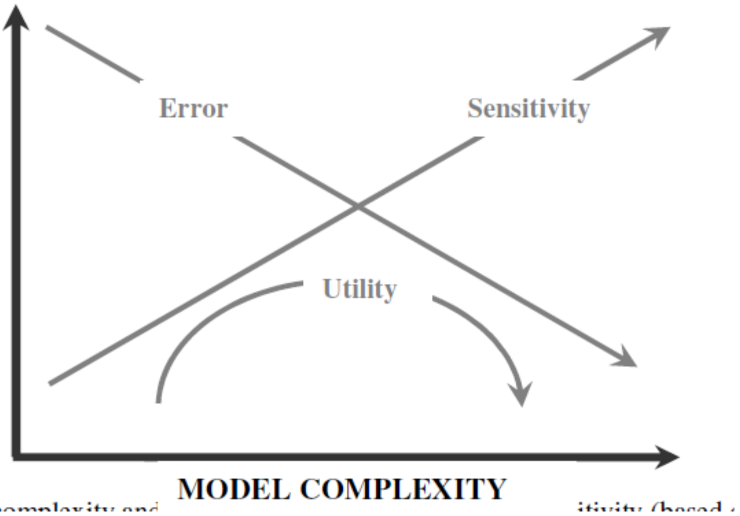

Figure 7. Relationship between model utility and complexity (from Adamson 2006, after Snowling and Kramer 2001).

[1] http\://www.investorwords.com/5662/model.html

4.2. Models for impact assessment in the Mekong

Impact assessments in the Mekong Basin can be grouped into four main groups:

- Basin-scale assessment of changes due to projected broadly-based WR development or climate change (usually scenario-based) (e.g. World Bank 2004; Costa-Cabral et al. 2007; Eastham et al. 2008; MRCS/BDP2 2009a).
- Basin-scale assessment of the impact of a specific large-scale development (e.g. Nam Theun 2 CIA – ADB 2004, Nam Ngum 3 CIA – ADB 2008)
- Local assessment of impacts of basin-scale changes including climate change (e.g. Friend et al. 2006; Kummu and Sarkkula 2008)
- Local assessment of impacts of specific developments (environmental impact assessments) (Hoanh et al. 2009).

A variety of tools have been developed at different scales to assess various aspects of flow modification in the Mekong: a listing of the main ones is set out in Table 4. The greatest focus to date has been in the hydrological domain: a number of quantitative models have been developed and applied for assessment of hydrology, hydrodynamics and sediment dynamics. Tools for assessing ecological and livelihood impacts of changed flow regimes are limited, and are mainly assessment frameworks or methods, rather than numerical models. Two economic models have been developed for the LMB (Ringler 2001; Rowcroft 2005), but neither model addresses ecological nor livelihood impacts in any detail. None of the major models provide assessment of groundwater resources or address the issue of groundwater – surface water connectivity.

While the number of models available can seem confusing, diversity is useful on a number of counts. First, a range of different models is needed for different categories and issues: for example, hydrological models do not provide information on flood extent. Secondly, within the same category a range of different models are needed to deal with the variation in spatial and temporal scales. Thirdly, different configurations of models have different strengths and limitations.

Adamson (2006) reviewed and compared the four main regional hydrological models for the Mekong (MRC's DSF, VIC, MikeBasin and Mike11, WUP-Fin) and concluded that each is appropriate for different applications. For example, MRC-DSF is the preferred system for regional scale appraisal of impacts of resource development in the LMB; VIC was the only basin scale model that incorporates the Upper Mekong (presently also WUP-Fin toolkit includes a basin wide hydrological model); MikeBasin has significant advantages in assessing specific infrastructure; and the WUP-Finn suite has advantages in assessing eco-hydrological issues such as sedimentation and water quality in the floodplain.

However, to gain the greatest benefit from model diversity, and to minimize duplication, a degree of coordination and consistency is required. The opportunities to improve this in the Mekong are briefly discussed at the end of the paper. The main themes include:

- tailored modelling (range of tools for different applications)
- cross-comparison of models in the same category
- transparency of model engine, scenario building, model results, calibration and validation
- communication between modellers, planners and decisions makers and other stakeholders
- local knowledge building – engagement of local universities and research institutes.

Table 4. Models for impact assessment used in the Mekong grouped to six main entities, namely hydrological models; water balance models; hydrodynamic models; economic, policy and Bayesian models; IA (impact assessment) frameworks; and e-flow concepts.

	Model	**Type**	**Area**	**Who**	**Mekong application**
HYDROLOGICAL MODELS	SWAT	Hydrological model	LMB	MRC MRC Technical Reports, described in Adamson (2006)	MRC DSF – input data for IQQM Sediment yield and transport 700 sub-basins
	SLURP	Semi-distributed hydrological model	LMB	IWMI (Kite 2001)	Hydrology of Mekong – fisheries impacts Climate change
	VIC	Distributed hydrological model	Whole basin	Washington University (Costa-Cabral et al. 2007; Thanapakpawin et al. 2007)	Hydrology of Mekong, Sediment transport; Carbon cycle Climate change
	VMod	Distributed hydrological model	Whole basin	WUP-FIN (MRCS/WUP-FIN 2006, 2007)	Basin wide model developed by EIA Ltd under IKMP programme of MRC. Several smaller scale applications exists, e.g. for Nam Songkhram sub-basin
WATER BALANCE MODELS	Lancang model	Rainfall – runoff model	UMB	Chinese Academy of Surveying and Mapping (Liu et al. 2007)	Lancang flows
	IQQM	Water balance, flow routing	LMB to Kratie	MRC MRC Technical Reports, described in Adamson (2006)	MRC DSF – Scenario assessment Assessment of flow regimes as input to negotiation of rules and procedures for water utilisation
	CSIRO Water use account	Water accounting	LMB	CPWF / CSIRO (Kirby, Mainuddin, and Eastham 2008; Kirby et al. 2008; Mainuddin, Kirby, and Chen 2008)	Assess impact of climate change on water resource Water productivity assessment
	MikeBasin	Water balance, flow routing	LMB to Kratie	NORPLAN and EcoLao for ADB (ADB 2004)	CIA for Nam Theun 2

	Model	Type	Area	Who	Mekong application
HYDRODYNAMIC MODELS	iSIS	Hydrodynamic model	Tonle Sap and Delta	MRC – Halcrow MRC Technical Reports, described in Adamson (2006)	MRC DSF – Scenario assessment Sediment transport
	VRSAP	Hydrodynamic model	Delta	VN SI-WRP (Khue 1986; Hoanh et al. 2009)	Water allocation in the Mekong Delta; sluice gate operations
	EIA 3D model	Hydrologic, hydrodynamic & WQ models	Sub-basins of LMB	MRC/WUP-FIN (consortium of SYKE; EIA Ltd. and TKK) (MRCS/WUP-FIN 2003, 2007)	Modelling of Tonle Sap flood pulse Modelling of Songkhram basin Modelling of Delta Sediment transport and erosion; nutrient transport
	MIKE21	Hydrodynamic model	Cambodian floodplain	MRC/WUP-JICA MRC technical reports and Fuji et al. (2003)	Modelling of Cambodian floodplain
	MIKE11	Hydraulic	Tonle Sap and Delta	NORPLAN and EcoLao for ADB (ADB 2004)	CIA for Nam Theun 2
ECONOMIC, POLICY, and BAYESIAN MODELS	Economic – hydrology model	Economic – hydrology model	LMB	IFPRI (Ringler 2001; Ringler and Cai 2006)	Economic optimisation of water allocation; valuing fisheries
	RAM	Economic – hydrology model	LMB	MRC – Rowcroft (2005)	Resource allocation model
	MRC-WorldFish	Fish population dynamics model	LMB	WorldFish / MRC - Halls and Kshatriya (2009)	Model of cumulative effects of mainstream hydropower dams on migratory fish populations in LMB
	Bay-Fish	Bayesian decision model	Tonle Sap, Bac Lieu	WorldFish (Baran, Makin, and Baird 2003; Baran et al. 2004)	Fisheries productivity and management model
	WUP-FIN Policy model	Bayesian decision model	Tonle Sap	TKK (Varis and Keskinen 2006)	Policy model
	ComMod	Agent-based models and role playing games	Nam Haen, Bac Lieu	(Bousquet and Trebuil 2005; Dung et al. 2009)	Support collective decision making on water resources (aquaculture and agriculture)

	Model	Type	Area	Who	Mekong application
IA FRAMEWORKS	IBFM	Impact assessment framework	LMB	MRC (MRCS/IBFM 2006)	Impacts of flow change on environment and livelihoods in LMB.
	BDP2-CIA	Impact assessment framework	LMB	MRC-BDP2 (MRCS/BDP2 2009b)	Impacts and trade-offs from water resources development in the Mekong – scenario analysis
E – FLOWS	*ELOHA*	*E-flows*	*(not used in Mekong)*	Poff et al. (2010)	*Framework for assessing and managing environmental flows*
	GEFC	*E-flows*	*(not used in Mekong)*	IWMI (Smakhtin and Anputhas 2006)	*Rapid assessment of environmental flow requirements*
	RVA / IHA	*E-flows*	*(not used in Mekong)*	Richter et al. (1997)	*Statistical method for setting streamflow-based river eco-system management targets*

Basin-wide hydrological models in the Mekong

Four of the most recent and comprehensive basin-wide modelling activities in the Mekong were selected for more detailed review and discussion. These include

- Mike Basin model application by ADB (2004) as a part of CIA of the Nam Thuon II hydropower project
- DSF (Decision Support Framework) model package under Mekong River Commission (World Bank 2004) by WUP-A consortium led by Halcrow Group Ltd.
- VIC (Variable Infiltration Capacity) model by Washington University (see e.g. Costa-Cabral et al. 2007)
- VMod model by former WUP-FIN team that consist of SYKE, EIA Ltd. and Aalto University (former TKK) (MRCS/WUP-FIN 2007)

The basin information of the four models is presented in Table 5. Three of them are coupled with a hydrodynamic floodplain model downstream from Kratie (see location in Figure 1). Mike Basin is coupled with Mike 11 model. DSF with iSIS model and VMod with EIA 3D model. VIC is planned to be coupled with the EIA 3D model in the future. This review, however, concentrates mainly on the hydrological models.

Table 5. Introduction to the compared basinwide hydrological models.

Model	Spatial scale	Model engine(s)	Institutional set up and the main reference(s)
Mike Basin	The Mekong Basin	Mike Basin model is defined as River Basin management model.	Modelling work was done by Norplan as a part of Nam Theun 2 CIA work (ADB 2004)
DSF (Decisions Support Framework)	The Lower Mekong Basin	Model package that consist of SWAT hydrological model and IQQM basin management simulation model.	DSF has been develop for Mekong River Commission by WUP-A consortium (MRCS/WUP-A 2003; World Bank 2004)
VIC (Variable Infiltration Capacity model)	The Mekong Basin	VIC: distributed hydrological model with resolution of ~10km	VIC model has been developed and applied by Washington University (Costa-Cabral et al. 2007; Thanapakpawin et al. 2007)
VMod	The Mekong Basin	VMod: distributed hydrological model with resolution of 5km	VMod model has been developed by EIA Ltd. and the modelling work has been a joint effort of EIA Ltd., SYKE and Aalto University (former TKK) (MRCS/WUP-FIN 2006, 2007)

Mike Basin

Mike Basin is a water balance model for simulation of water allocation, reservoir operation, irrigation and other water uses. It provides a framework for managers and stakeholders to address multi-sectoral allocation and environmental issues in river basins. It is designed to investigate water sharing issues at international or interstate level, and between competing groups of water users, including the environment. The model has been developed by DHI (www.dhigroup.com).

For hydrologic simulations, the model builds on a network model in which branches represent individual stream sections and the nodes represent confluences, diversions, reservoirs, or water users. The ArcGIS interface has been expanded accordingly, e.g., such that the network elements can be edited by simple right-clicking. Technically, Mike Basin is a quasi-steady-state mass balance model, however allowing for routed river flows. The water quality solution assumes purely advective transport; decay during transport can be modelled. The groundwater description uses the linear reservoir equation

The application for the Mekong basin was done by Norplan as a part of Nam Theun 2 CIA work (ADB 2004). The whole basin was included in the simulations and cumulative impact of hydropower development across the basin was simulated. A baseline scenario was established by attributing catchment runoffs to gauging stations at Chiang Saen, Vientiane, Thakek, Savannakhet, Pakse and Kratie. The runoff series were established by subtracting the discharge at the gauging station upstream (ADB 2004). Cumulative impacts for years 2010 and 2025 are included the operation of a number of new hydropower projects. The active storages for the included projects are 19 km^3 and 44 km^3 for years 2010 and 2025, respectively.

DSF: MRC Decision Support Framework

The DSF has been developed for Mekong River Commission by WUP-A consortium[2] (MRCS/WUP-A 2003; World Bank 2004). The DSF consist of three different simulation models: SWAT, IQQM and iSIS (MRCS/WUP-A 2003). A series of hydrological models, based on the SWAT software of US Department of Agriculture, have been set up to simulate catchment runoff. The SWAT model was used to estimate inflows to the other simulation model, namely IQQM.

The basin simulation model uses the IQQM software developed in Australia. The basin simulation models route sub-basin flows through the river system, making allowance for diversions for irrigation and other consumptive demands, and for control structures such as dams. The main basin simulation model covers tributaries and the mainstream of the Mekong River down to Kratie. Simulation models were also set up to estimate irrigation demands for the Great Lake and Mekong Delta regions.

A hydrodynamic model, based on ISIS software developed by HR Wallingford and Halcrow, is used to simulate the river system downstream of Kratie to the South China Sea. The hydrodynamic model represents the complex interactions caused by tidal influences, flow reversal in the Tonal Sap River and over-bank flow in the flood season with the varying inflows from upstream. A salinity intrusion model was also set up with the ISIS software using results of the hydrodynamic model.

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[2] The WUP-A was led by Halcrow Group Ltd.

VIC: Variable Infiltration Capacity model

VIC is a macro-scale (resolution of 10 km) hydrologic model that solves full water and energy balances, originally developed at the University of Washington (Liang et al. 1994). It is a semi-distributed grid-based hydrological model that parameterizes the dominant hydro meteorological processes taking place at the land surface - atmosphere interface. A mosaic representation of land surface cover, and sub grid parameterizations for infiltration and the spatial variability of precipitation, account for sub-grid scale heterogeneities in key hydrological processes.

The model uses two soil layers and a vegetation layer with energy and moisture fluxes exchanged between the layers. Vegetation and soil characteristics associated with each grid cell are reflected in sets of vegetation and soil parameters. Parameters for vegetation types are specified in a user defined library of vegetation classes (usually derived from standard, national classification schemes), while their distribution over the gridded land surface area is specified in a vegetation parameter file. Soil characteristics (e.g. sand and clay percents, bulk density) can be represented for a user-defined number of vertical soil layers - usually two or three, divided into a thin upper layer and a secondary set of layers that extend several meters into the soil column.

VMod model

The EIA VMod hydrological model is developed by Environmental Impact Assessment Centre of Finland Ltd (EIA Ltd.). The VMod model is a distributed physically based/conceptual hydrological model based on grid representation of the modelled catchment (resolution of 5 km). Hydrological processes in the catchment are simulated using simplified physically based formulations. The catchment is described in the model as a group of grid cells and water balance, runoff and leaching of nutrients are calculated separately for each grid cell. From the grid cells, runoff is collected to the catchment's outflow point with a river net model, where calculation of lakes is included as well. The model can be used, for example, to inspect the effect of land-use changes to catchment hydrology. The model includes also a nutrient leaching and transport module that enables, for example, simulation of the effect of land-use changes to water quality.

The model is based on rectangular grid, where each grid cell is individually computed and has an own set of parameters such as ground slope and aspect, vegetation type and soil type. These grid values are obtained from digital elevation model, land use data and soil type data. In each of the grid cells simulated hydrological process, include precipitation, snow hydrology, infiltration, evapotranspiration, seasonal vegetation development, soil water content, groundwater height, and flow into streams. Groundwater flow and stream flow are computed between grid cells. The soil has been divided into two layers and the layer depths can be defined freely. The water storage of both layers is divided into two differently behaving parts in field capacity water content.

The floodplains downstream from Kratie are modelled with the EIA 3D model system. The model is fully three-dimensional finite difference model based on rectangular grid representation of the target area. The model system accommodates meteorological, hydrological, topographic, land use and infrastructure characteristics and produces 3D hydrodynamics and water quality as a result. The modelling platform includes data processing, model control, GIS, database control, model data products and visualization (Koponen, Kummu, and Sarkkula 2005; MRCS/WUP-FIN 2007). The modelling work has been a joint effort of EIA Ltd., SYKE and TKK (MRCS/WUP-FIN 2006, 2007).

5.1. Modelling arenas and actors in those

We attempt here to identify the main actors and possible decision making arenas for each modelling effort (Table 6). There might be, however, other arenas as well not listed in the table. It needs to be mentioned as well that it was very difficult to assess within this study how much the modelling work has finally impacted on the decision making processes within these listed arenas. The comprehensive analysis of the issue would require much more work and the authors suggest this to be done in the future with carefully planned questioners and interviews targeting to the key persons from different Arenas and Actor groups.

Two of the model applications have been developed within MRC, namely DSF and VMod. The Mike Basin application was a consultancy work for NT2 hydropower project and the fourth attempt is independent work under Washington University. The DSF modelling package is most widely used in various projects, such as IBFM (Integrated Basin Flow Management), BDP phase 1 and 2 (Basin Development Plan), and is the only basin-wide model package that has been officially approved by the countries.

Table 6. Actors and arenas of the Mekong basin-wide model attempts.

Model	Time-line	Actors	Arenas used in the decision making processes
Mike Basin	2004	- Consultant Norplan (consultant) - ADB	The modelling work was done as a part of the NT2 hydropower project CIA process. It also included the cumulative impacts of the basinwide future water resources related development plans. The study was finalised, however, only after the construction of the NT2 had basically started. Therefore, the influence for the decision makings related to NT2 project remains a bit questioned. The work is well documented and available freely in internet. Therefore, the work has been often cited in the academic articles being the first transparent and well documented CIA done in the Mekong Basin. However, the role in the decision making arenas is unclear.
DSF	2001-	There are several actors involved in DSF: - MRC management staff - WUP staff - MRC modelling team - National Mekong Committees (NMCs) - World Bank (funder) - Halcrow (consultant)	The work started as a part of the WUP programme and is continued as a part of the IKMP under MRC. DSF is the only modelling effort that has been approved officially by the LMB countries and thus, the model has a special role in that sense on the decision making arenas such as ministries in the LMB countries. Further, the DSF results were presented in hydropower consultation in 2008, being one of the first attempts where the stake holders from various sectors were present related to the recent boom in hydropower construction. The DSF is not, however, transparently documented to the wider public. This would increase its value significantly.
VIC	2002-	The main actor has been the research team led by Prof. Jeffrey Richey at Washington University. The team has MoU with MRC with whom they have done collaboration.	VIC has been mostly an academic work by Washington University and the main decision making arena for that has been the academic publications (see e.g. Costa-Cabral et al. 2007). Through the recent signed MoU with MRC may change the role of the modelling work in the future.

Model	Time-line	Actors	Arenas used in the decision making processes
VMod	In tributaries: 2001- Basinwide modelling: 2009-	The main actors are at the moment in basinwide modelling: - EIA Ltd. - Aalto University (former TKK) - SYKE Further, the following actors are involved in the process: - MRC management staff - WUP staff - MRC modelling team - NMCs - various trainees from the riparian countries - Government of Finland (main funder)	The basinwide modelling work is part of the IKMP programme at MRC. The work is based on the former WUP-Fin project work and team. The arenas used in the decision making are both through MRC and academic publications (see e.g. Keskinen 2008; Kummu and Sarkkula 2008; Varis, Keskinen, and Kummu 2008). Further, the work has been presented in various workshops across the basin. The basinwide work is, however, very recent effort of the group and therefore, it has not yet been finalised neither therefore published.

5.2. Comparative case analysis

We aim here to analyse and compare the modelling efforts in more detail, attempting to find answers to the issues such as:

- Model purpose
- Model structure
- How adequately they represent biophysical processes
- Model user groups
- The form of presentation of simulation results
- Model limitations and prospects for improvement
- Transparency of model engine, model application, and presentation of model results
- Future development of the models

The comparison of the models is being done with brief summarising paragraphs and following tables (Table 7; Table 8; and Table 9). Detail comparison of the model results has not been undertaken due to the reasons explained in more details in Section 6.

The main purposes of each model activity are presented in Table 7 together with the representation of the biophysical processes. All the models are used for assessing the impact of recent development activities. The VIC is further used to understand better the carbon fluxes in the Mekong basin.

Mike Basin can be classified as water balance models while VIC and VMod are distributed hydrological models based on grid representation. In DSF two models are integrated together, where IQQM is model water allocation model while SWAT is semi-distributed physically based model based on sub-catchment representation.

Table 7. Basin-wide models' structure, purpose and representation of biophysical processes.

Model	Modelling parts	Purpose of the modelling	Representation of biophysical processes
Mike Basin	Mike Basin model for the whole basin down to Kratie and Mike 11 model for the floodplains and Tonle Sap Lake.	The modelling work was part of the NT2 hydropower plant CIA aiming to model the impact of NT2 on the basin wide hydrology.	Mike Basin modelling package is rather a water balance model than hydrological model. The model is used for simulation of water allocation, reservoir operation, irrigation and other water uses. Therefore, the biophysical processes themselves are not well covered by the model.
DSF	DSF comprises a suite of models that make it possible to simulate major hydrological aspects of river basin behaviour. The following models are included: - SWAT hydrological model - IQQM basin management simulation model Further, the suite include ISIS 2D hydrodynamic model for the floodplains downstream from Kratie.	The DSF was set-up to assist in meeting the requirements of the Mekong River Agreement (see Mekong River Commission 1995) in respect of water sharing, water quality and environmental flows (World Bank 2004). The DSF aim has been mostly to provide estimation of development impacts on hydrology to support the BDP and IBFM processes. The original aim of the DSF was to contain containing information on the historical and existing biophysical resources and, when fully populated, socio-economic and environmental conditions, as well as predictions of how these may change in the future	The SWAT hydrological model has good representation of the biophysical processes. However, the integration of the SWAT model results to IQQM basin management model has been challenging.
VIC	VIC distributed hydrological model with resolution of ~10km for the whole basin.	The primary aim of the modelling has been to provide a base for the understanding the carbon fluxes in the Mekong. The model has been used, however, increasingly to assess the development impacts on hydrology.	The model is distributed 2D model and the representation of the biophysical processes is done well in the model.
VMod	VMod distributed hydrological model with resolution of 5km. The model is linked to EIA 3D floodplain model from Kratie downstream.	The main aim of the modelling is to assess the impacts of the recent development activities on the hydrology and sediment transport as a part of the IKMP programme at MRC.	The model is distributed 2D model and the representation of the biophysical processes is done well in the model.

The user groups of the models are presented in Table 8. Mike Basin and VIC have been used by rather limited groups of people of one or two organisations. The DSF is used widely by modelling team in MRC and NMCs (National Mekong Committees) and some line-agencies in the riparian countries. VMod has been used by WUP-Fin team, MRC modelling team, and training has been provided rather widely in NMCs, line-agencies and riparian universities.

The model results are presented rather well in accessible sources. The DSF results, however, were for a long while and still partly unpublished. The BDP2 has brought more transparency to the sharing of model results and those are well available at the moment (Table 8).

Each model has its own limitations. The limitations can be divided to two parts: a) limitations of a model engine itself; and b) limitations of the model application in the Mekong. Some of the limitations of both of these parts for each model activity are discussed in Table 8.

Table 8. The users of the basin-wide models; how the model results are presented; and limitations of the models.

Model	By whom the model has been used	How the results are presented	Limitations of the model
Mike Basin	The Mike Basin model is widely used in various basins. The Mekong basin application has been used by the Norplan only within the consultation project.	The results are well presented and documented in a transparent way. The main hydrological impacts for different time and spatial scales are clearly presented.	The model is able to predict well the development impacts on water resources but it would be difficult to analyse e.g. landuse change or climate change impacts on hydrology with the model. However, it fits well for the purpose it was used.
DSF	The model suite has been developed under the Mekong River Commission by WUP-A, a sub-component for the Water Utilisation Programme. The model has been used by the modelling at MRCS and NMCs (National Mekong Committees).	The MRC has not really presented the results of the DSF during BDP phase 1; neither IBFM in a comprehensive way that would have been open for the public. The World Bank, one of the main funders of DSF, has however published one report of the modelling attempt and its results (World Bank 2004). The situation has, however, got better through the BDP2 process where DSF results have been presented in various stake-holder consultations and the reports are available on-line (e.g. Mekong River Commission 2008b).	The hydrological limitations are the ones reported by Adamson (2006), being that it has not been developed for predicting the hydropower impacts on hydrology and neither it is suitable for predicting the climate change impacts, both being the main concerns for the basin in the future.
VIC	The VIC model is being used in various basins such as Amazon Basin. The Mekong basin model application is used by Washington University and previous version of the model is in use within the SEA START group at Chulalongkorn University.	The results have been presented well through peer-reviewed journal articles.	The resolution of the Model is rather coarse (~10km) for more detailed modelling work in a tributary scale. The resolution is, nevertheless, enough for the basin wide study.
VMod	The model is being used mainly by EIA Ltd and Aalto University (former TKK) modellers. Further, the extensive training in the Mekong region has results some end users in Cambodia, Laos and Thailand. Training has provided for the NMCs and various universities in the region.	The final results for the basin-wide simulations are not yet ready and thus not published. The previous results of the VMod applications in the Mekong tributaries are documented and presented in WUP-FIN reports that are available on-line at www.eia.fi/wup-fin.	The model has been originally developed for the Nordic conditions. The model is, however, being modified to fit better to Mekong conditions and in tributary scale the model results are very good. The pilot results for the basin wide are promising as well. The final results are not yet, however, available.

Transparency of a model can be assessed in various ways. It can be assessed by estimating issues such as access to code, access to model, access to documentation (including assumptions, etc of the model application), and access to the model results. These different aspects of transparency are briefly discussed in Table 9. There are differences how transparent the models are. In most of the models the model engines are transparent and well documented. However, only in VIC all the four 'components' are published well in peer-reviewed journal articles. The DSF model has challenges in being transparent but the situation has got better within BDP2 process.

Table 9. Transparency and future development of the selected basin-wide models.

Model	Transparency of a model	Could the transparency be improved?	Future development of the model
Mike Basin	The model is not based on open-source code but the model engine is rather transparent as it has been examined by various reviewers. The modelling attempt in the Mekong is being documented rather transparently. The model results are presented well in freely available report. Those are not, however, peer-reviewed by any independent reviewer.	The model engine is not based on open-source code and thus, even though it has been reviewed the code behind the model is not very transparent.	The model engine itself is under continuous development. The Mekong model application is not, however, being updated since 2004.
DSF	Each of the model engines is rather transparent, although the models' code is not open-source. The suite of models is not, however, that transparent as the documentation is not well accessible. The modelling work lacks of transparency as the documentation has not been publicly open and calibration neither validation results have not been well documented. This is, however, now changing thanks to BDP2 where well organised stake holders meetings are hold and documentation is available on-line. .	There are various ways of improving the transparency of the modelling work. The main would be more open documentation and publication of the model calibration, validation and scenario results. Further, the Mekong application should be documented in details.	There is currently on-going the development of the DSF by Halcrow within the IKMP (Integrated Knowledge and Management Programme) component 4.
VIC	The model is based on open-source code and the model has been reviewed by independent reviewers through various journal publications. The model results are also published in peer-reviewed journal articles.	-	The model engine is under continuous development by the Washington University. Also, the Mekong application is under continuous development and improvement.
VMod	The model is based on the open-source code. The description of the model has been published in internet as all the model applications in the Mekong. The model results are not, however, yet public as only the pilot runs have been finished so far.	Detail peer-reviewed journal article of the model engine and validation of the case studies would increase the transparency of the model.	The model engine is under continuous development by the EIA Ltd. The Mekong application is under work by the joint effort of EIA Ltd., Aalto University (former TKK) and SYKE.

Cross comparison of model results

Comparison of model results can be carried out at two levels: at a general level to establish whether there is **consistency** between the results from different models (regardless of type); and detailed cross-comparison of similar types of models to help establish the **uncertainty / accuracy** involved. At this stage, structured cross-comparison of results from different modelling projects in the Mekong has been limited. Each model suite has been developed and used to answer different sets of questions, so direct comparison of results is difficult. Differences result not only from differences in the modelling platform, but also from a mix of other issues, including underlying assumptions, input data and the way research questions are posed. Two examples are given below to illustrate the difficulties involved in cross-comparison of results:

- Kummu and Sarkkula (2008) compared the results from three major cumulative impact assessments (CIA) on the impact of basin development on Tonle Sap Lake (Table 10). All three predicted higher dry season water levels and lower flood peaks, but the magnitude of the resulting change in calculated dry season lake area varied from 6% to 30%.
- Eastham et al. (2008) modelled hydrological impacts of climate change in the Mekong to 2030. Using a water accounting methodology, and based on the assumption (from the A1B SRES scenario) of an average increase in rainfall of 0.2 m (13%) they predicted a 21% increase in overall flow in the river and an increase in probability of “extreme wet” flood events from 5% to 76%. In contrast, Hoanh et al. (2004) modelled hydrological impacts of climate change in the Mekong to 2039, using the SLURP model. Based on an assumption (from the A2 and B2 SRES scenarios) of a minimal change in overall precipitation but with different sub-basins varying from -6% to +6%, they predicted a decrease in average monthly flows of 7-11%, with a small increase (1%) in maximum flows, but large decrease in minimum flows.

In each case, the underlying assumptions (about the degree and nature of basin development in the first example, and about climate scenarios in the second) were fundamentally different, so the variance in results is not necessarily due to inaccuracies or inconsistencies in the models. However, it illustrates clearly the difficulties involved in comparison of model results, and the confusion that could potentially result for policy makers or planners attempting to use model results. These issues can only be addressed by very careful and transparent presentation and explanation of the assumptions and limitations inherent in the modelling process.

However, both consistency and inconsistency can provide important information. In the Tonle Sap case above, the consistent projection of higher dry season and lower wet season lake levels resulting from upstream development is an important consideration for planning and management, regardless of the exact magnitude of the changes. In the case of differing projections for the impact of climate change on Mekong flows, the important message is that of uncertainty, and the need to factor uncertainty into planning.

Detailed cross-comparison of results from different models analysing exactly the same problem, can help to establish the range of variation in results as an indicator of the accuracy / error of the models. Direct comparison is only valid across a consistent category of models: it is possible, for example, to compare the results from ISIS, EIA 3D model, VRSAP and Mike11 (all hydrodynamic models); or to compare WEAP and IQQM; but we cannot try to compare ISIS with WEAP. Within a single category, the use of a range of models can provide an indication of the uncertainty involved: this is the approach used by the IPCC in assessing climate change, where a large number of climate models of different complexity were used to define an envelope of likely results (e.g. Randall et al. 2007).

It would be useful in the Mekong to establish a framework for a structured cross-comparison of the major modelling suites, using a coherent set of questions and assumptions; and a platform and mechanism for collating and comparing results. Various models could be applied with the same initial conditions for modelling the impacts of the same development scenarios. This would provide a better understanding of both consistency and uncertainty, more reliable estimation of the range of impacts, and improved understanding of each of the models and their strengths. It could also act as a catalyst for better collaboration, to allow more targeted application of specific models in their areas of greatest strength. A future approach for using models as a part of IA process in the Mekong could be the establishment of a coordinated modelling cluster, following the example of the IPCC.

Table 10. Cross-comparison of results from three CIA studies regarding impacts of development on Tonle Sap Lake

	MRC DSF (World Bank 2004)	**ADB - Nam Theun 2 (ADB 2004)**	**Adamson (2001)**
Assumptions and methods			
Increase in storage	49.5 km^3	54.9 km^3	22.7 km^3
Increase in irrigation	+53%	-	-
Other developments	Increased domestic and industrial use, intra-basin diversions	Increase domestic and industrial use	-
Method / model used	DSF - Hydrological and hydrodynamic model	MikeBasin - water balance and hydrodynamic model	Statistical analysis
Impact on Tonle Sap water levels			
Wet season	-0.36 m	-0.54 m	NA
Dry season	+0.15 m	+0.60 m	+0.30 m
*Min area (change from observed)**	2532 km^2 (6%)	3107 km^2 (30%)	2712 km^2 (11%)
*Max area km^2 (change from observed)**	12,559 km^2 (4%)	12,168 km^2 (7%)	NA

** estimated by Kummu and Sarkkula 2008.*

Broad implications of the models: gaps, challenges and future opportunities

7.1. Major gaps in the Mekong modelling

There has been very significant effort in developing models to assess the impacts of hydrological change in the Mekong, as indicated by the large number and variety of models listed in Table 4. Adamson (2006) concluded that "*this family of modelling systems: the MRC's DSF, the VIC (Variable Infiltration Capacity) model, Mike Basin – Mike 11 and the WUP-Finn suite sums to an ensemble that embraces just about all of the needs of hydrological, resource and environmental studies within the Mekong region*", with the caveat that "*more specialised sub-regional simulation studies, such as those with regard to saline intrusion and water quality management in the Mekong Delta in Vietnam are obviously best dealt with by the specific systems developed at the national level*".

There is obviously an argument to be made that sufficient effort has gone into building models, and that the issue now is to make best use of existing tools to provide thorough, balanced assessments. There are, however, still areas in which models are lacking or inadequate. Four of such areas are listed and briefly discussed below; in all of the cases this is linked closely to paucity of data.

Groundwater and its interaction with surface water. Groundwater and surface water are known to be very closely linked in the Mekong floodplain and delta, (CIAP 1999; Raksmey, Jinno, and Tsutsumi 2009), and there are many other areas, such as the limestone provinces of central Laos, with major aquifer systems. None of the major modelling suites currently operating for the Mekong has a working groundwater model. Both MikeBasin and the WUP-FIN suite have the capability for such a component built in. However, data on groundwater in the Mekong region are very sparse, and building and calibrating a groundwater model at regional scale for the Mekong would require a major research effort.

Modelling the ecological and livelihood impacts of flow modification. Because of the complexity of ecological responses, this has generally been approached by concentrating on a single component, such as fish in the Tonle Sap (see for example Baran, Makin, and Baird 2003; Baran et al. 2004), and flooded forests in Tonle Sap (e.g. Kummu and Sarkkula 2008) and some studies assessing impacts in particular areas (e.g. Keskinen et al. 2005; Friend et al. 2006). MRC's IBFM (Integrated Basin Flow Management) Program (MRCS/IBFM 2006)aimed to provide a coherent framework for assessing ecological and livelihood impacts along the Mekong mainstream, but has been discontinued. International programs have developed methodologies for setting streamflow-based river ecosystem management targets (for example, ELOHA – Environmental Limits of Hydrological Alteration – Poff et al. 2010) but these have not yet been applied in the Mekong.

Links between ecosystems and economy. In this case, it is the paucity of data, rather than lack of a modelling platform, that is of most concern. Ringler (2001) and Rowcroft (2005) made preliminary attempts to model the economic impacts of flow changes. MRC-BDP2 is establishing a methodology and framework to assess economic, environmental and social impacts of basin-wide water development (MRCS/BDP2 2009b). However, all these efforts are hampered by the lack of information on the economic valuation of ecosystems and ecosystem services.

Optimisation of hydropower operation rules. This crucial part of modelling the hydropower impacts is not yet well covered, in our opinion, by any of the basin-wide modelling attempts. When modelling the impact of hydropower construction it is critical to get the dams' operation rules correct to be able to rely on the simulation results of possible flow regime changes due to the dam operation. The majority of the dams are, most probably, operated to maximise the profit. This leads to the daily (electricity produced e.g. during day time), weekly (electricity produced only during weekdays) and seasonal (water is stored from wet-season to dry season) fluctuations. With the available optimisations models it is possible to predict rather well the seasonal fluctuations but daily and weekly operation rules are more difficult to include into the models as most of the optimisation models are based on monthly time step. Thus, more work is requires and also, preferably, better collaboration with the dam operators and power companies to get the actual operation rules into the models.

7.2. Discussion of general issues related to the modelling attempts

The role of models in the impact assessment is double sided. The modelling is one of the few options available to look at the questions of future changes and impacts of human activity on water resources, as stated by Sarkkula et al. (2007). On the other hand, modelling can be seen as a mathematic toy of the modellers with full of assumptions and open questions. Nevertheless, modelling can be a useful tool as a part of IA work when done right with good ethics by using transparent and scientifically sound modelling tools.

In summary, the modelling as a part of IA process has lots of possibilities as have been seen in recent years e.g. as a part of IPCC process. Such a large analysis with hundreds of parameters would be difficult to do without powerful mathematical models. On the other hand, there are challenges in the modelling, particularly what comes to the reliability of the modelling results and disseminating the results to the decisions makers and wider public.

The future approach for using the models as a part of IA process could follow the example of the IPCC as stated above. Various models could be applied with similar initial conditions for modelling the impacts of the same development scenarios. The modelling results could then be gathered together by the coordinator of the modelling cluster. As a result, there would be more reliable estimation for the range of impacts.

When using a hydrological model for conducting a HIA, there are several key points that needed to be taken into account. Everything starts from the hydrology; the model needs to be able to model the hydrology in the conditions in question well. The model parameters are calibrated against the measured discharge data and validated against another time period.

When selecting the model for HIA, it should be made clear from the beginning that the model is capable of modelling the impacts of the human activities that are included in the analysis, such as hydropower, irrigation, deforestation, and water diversion. Each of them needs special features from the model engine. For example simpler water balance model might be enough for modelling the impact of hydropower operation while 2D distributed hydrological model is needed to model the impact of land cover changes.

Water quality, e.g. sediments, is the next step to be modelled after the hydrological impact. This should be thought through as well from the beginning of the modelling project. Some hydrological models are capable to take into account various water quality parameters as well. Thus, there would not be a need for new model if water quality wanted to be included in the analysis later on.

Finally, equally important part of the modelling activities is the dissemination of the results. There is still much to do in this section, i.e. how to bring the information to the different actors and end users.

7.3. Challenges and opportunities in the Mekong modelling

Until now probably the main challenge has been in the Mekong that only one model system has been used for the various large modelling attempts under MRC such as BDP, BDP2, IBFM, and IKMP. Further, the modelling work has not been reviewed properly according to the best knowledge of the author and thus is subject to inaccuracies. We identified five opportunities to improve in the Mekong modelling community as presented below.

Model comparison: In order to increase the reliability of the results, it would be extremely useful to be able to do model comparison. There could be things to be learned from the IPCC process, as stated already above. In the IPCC various modelling results are brought together. This multiple model use would increase remarkably the reliability of the modelling results. Moreover, it would increase the collaboration between the different actors if done with open minds and transparent way. At the same time, however, the dissemination of the modelling work would be increasingly difficult as that should be coordinated well between the different model results.

> **Opportunity 1:** to conduct a model ensemble of multiple models aiming to increase the reliability of the impact assessment results. MRC could act as a coordinator in this and DSF could be one of the tools. Other tools could be e.g. VIC by Washington University and VMod by former WUP-FIN consortium. The same development scenarios would be used in each of the application.

Tailored modelling is stated to be the best approach for impact assessment. It would be recommendable that the modelling tool is selected to meet the needs, not to fit the problems on the model set-up. One model cannot do all and therefore a set of model need to be applied to meet the needs. All the basin wide models in the Mekong should be reviewed critically by keeping this in mind. Further, this would be one justification why it would be beneficial to have various models applied in the basin and not just one.

> **Opportunity 2:** to conduct a detail model comparison to look at each model attempt with recommendations for the future model system of set of models.

Transparency of the model engine, scenario building and model results is important part of all the modelling activities. To many of the end users the model is like a black box and therefore it would be important to openly share the calibration and validation results of the model. The same applies to the development scenarios of the impact assessment procedure: it is highly important that the used scenarios and all the details in those, are independently reviewed, openly presented and disseminated.

> **Opportunity 3:** each basin wide modelling attempt should be reviewed carefully by independent reviewers. This could be done through e.g. scientific journal publications. Further, the development scenarios used for each modelling attempt could be coordinated and naturally well justified by the users.

Communication between modellers, planners and decisions makers and other stake holders has been a challenge for a long time in the multidisciplinary work. Related to this, Nancarrow (2005) addresses some interesting issues on modelling, and particularly on the relationship between modellers and social scientists. She points out the differences in their overall approaches that are, in summary: modellers simply assume problem and start by defining and collecting data needed to solve it, while social scientists start by identifying the different stakeholders and how they see and define the problem. The modellers should pay more attention to the way of presenting the results in understandable way to different actors and end users.

> **Opportunity 4:** stakeholder consultations, such as the Hydropower consultation in September 2008 in Vientiane, could be organised more often to increase the interaction between the above mentioned actors. However, there is still lot to do in order to find the common language and ways to present the modelling results in an understandable way.

Local knowledge building is crucially important part of the modelling project in the region and has been high on the agenda in the MRC and other modelling attempts. However, it is difficult to measure how well this work has been done.

> **Opportunity 5:** The past activities could be assessed and then new plans for the possibly more sustainable way of capacity building could be drawn up. One option for the more sustainable way of building the local capacity and knowledge would be to involve the regional universities and other research centres more actively in the IA process itself. Again, as stated already in Section III, the Mekong region universities could play a large role in the earlier proposed model ensemble.

7.4. Possible role of MRC in the modelling

MRC has been one of the main organisations doing modelling in the Mekong Basin. At the same time, MRC is in a unique position in the Mekong by forming intergovernmental body over the water resources issues. MRC is using one major model package, DSF, in its impact assessment work. The DSF has been approved by all the LMB countries and is used in various programmes under MRC.

By using only one model, it is difficult to get an idea of the reliability of the results. This could be compared to the Intergovernmental Panel on Climate Change (IPCC) work where 23 model results are used to estimate the climate change impacts (see e.g. Randall et al. 2007). The use of set of models with the same development scenarios would increase the reliability and level of confidence of the modelled HIA results. At the same time, however, the proper dissemination of the results would be even more crucial as it might be to some stakeholders confusing to have various modelling results. Thus, the results should be presented in coordinated way as IPCC has done.

Therefore, one possible approach for such an organisation as MRC would be to act as a platform and coordinator for the set of modelling activities, still of course having their own modelling activities. The modelling work itself would be done in the independent research agencies, both in the region and internationally. For all the models same initial conditions and future development scenarios would be used. This could give more reliable and scientifically sound modelling results.

The approach could involve more regional universities and build up capacity in broader context in the region if managed and done well. It might, on the other hand, increase the risk of whether the work will be done properly. At the same time, the approach would be more open and more transparent way of working than currently only the in-house modelling approach.

Final remarks

"All models are wrong; some models are useful". [3]

Models are inherently simplifications of reality; they are thus always inaccurate at some level. Conversely, numerical models are often technically very complex, so that for all but a few experts, they function as "black boxes" where there is little transparency in how output results are reached. Combined with apparently contradictory results from different models, these factors can result in significant cynicism and distrust of models amongst some policy makers and planners: they can be seen as mathematical toys, full of assumptions and open questions. On the other hand, amongst those who routinely use models and their results, there can be a tendency to regard the model results as representing the system, and to disregard or downplay the assumptions and inaccuracies involved.

Models are an essential component of planning and managing change in the complex, inter-related water resource systems of the Mekong. The increasing sophistication and diversity of available models provides a crucial toolbox for impact assessment, but they must be used in a context where the underlying assumptions and limitations of the models, input data and the resulting projections are clearly spelled out for users. It is important that the modelling itself is done well and transparently, but transferring the results to decision makers and stake-holders in an understandable format is equally important, and often neglected.

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[3] Box, George E. P.; Norman R. Draper (1987). *Empirical Model-Building and Response Surfaces*. Wiley. pp. p. 424. http://en.wikiquote.org/wiki/George_E._P._Box

Annex: Annotated bibliography

The key literature is annotated below. The full list of references follows after this.

Adamson, P.T. 2006. Hydrological and water resources modelling in the Mekong Region: A brief overview. In *Mekong Region Waters Dialogue*. Co-convened by IUCN, TEI, IWMI, M-POWER. Vientiane, Lao PDR. 6-7 July 2006.

> This paper provides a brief overview on the hydrological and water resources modelling in the Mekong, concentrating on the modelling activities taken place at the MRC, namely DSF (decision support framework) and WUP-FIN. Also VIC model developed by Washington University and Mike Basin models are briefly discussed. Adamson address relevant points on the process of model selection, highlighting the importance that there will never be a single integrated modelling system but rather a family of custom-built models. He also discusses the challenge in the selection where there is always the trade-off between complexity, error and sensitivity on the one hand, and utility on the other. He argues that most of the models in the Mekong are "fit for purpose". He also point out the importance of data for the modelling.
>
> Adamson gives a short summary of each modelling activity and provides a table where role, advantages and limitations of each model effort have been briefly presented. Adamson summarises the modelling actions in the Mekong as follows: *"The family of modelling systems – the DSF, VIC, Mike Basin – Mike 11 and WUP-Fin suite – combines to provide an ensemble that embraces just about all the needs of hydrological, resource and environmental studies within the Mekong region."* However, he calls for more formal co-ordination and knowledge sharing arrangements.

ADB. 2004. Cumulative impact analysis and Nam Theun 2 contributions: Final report. Prepared by NORPLAN and EcoLao for Asian Development Bank. 143 pp.

> This report presents the results of the CIA of the Mekong basin development activities, concentrating on hydropower. The study can be categorised as hydrological CIA (i.e. sectoral CIA). The work was undertaken by Norplan and EcoLao. They used Mike Basin and Mike 11 models for the assessment. The report provides rather transparent and well documented CIA. The CIA conducted and results of that are analysed in more detail in the CIA part of the Tool reviews of PN67.

Costa-Cabral, M.C., J.E. Richey, G. Goteti, D.P. Lettenmaier, C. Feldkötter, and A. Snidvongs. 2007. Landscape Structure and Use, Climate, and Water Movement in the Mekong River Basin. *Hydrological Processes* 22 (12):1731-1746.

> This article gives a brief overview on the VIC distributed hydrological model. The article addresses the relative roles of precipitation and soil moisture in influencing runoff variability in the Mekong River basin. The evidence found in this study for the influence of land cover type on soil moisture implies significant hydrologic consequences for large scale deforestation and expansion of agricultural land.

MRCS/IKMP. 2008. MRC modelling requirements and tools analysis. MRC Information and Knowledge Management Programme (IKMP), Hydrological, Environmental and Socio-Economic Modelling Tools for the Lower Mekong Basin

Impact Assessment/ FINDS. Mekong River Commission Secretariat (MRCS), Vientiane.

This report aims at practical action plans related to the MRC programmes modelling needs. It focuses on what needs to be done and how can it be accomplished. The needs assessment is based on Programme documents and foreseeable tasks. The analysis covers both immediate and long-term needs. In this report especially the procedure by which the modelled "hydrologic changes will be used by experts to quantify the defined environmental, economic and social assessment indicators" is considered to need additional modelling support.

MRCS/WUP-FIN. 2007. Final Report - Part 2: research findings and way forward. WUP-FIN Phase 2 - Hydrological, Environmental and Socio-Economic Modelling Tools for the Lower Mekong Basin Impact Assessment. Mekong River Commission and Finnish Environment Institute Consultancy Consortium, Vientiane, Lao PDR. 126 pp. Available on-line at http://www.eia.fi/wup-fin/wup-fin2/publications.htm.

This report is a product of an extensive collaboration of Finnish, international and riparian experts. The purpose of the report is to describe and justify the approaches and strategies applied within the project as well as to summarize and synthesize the main results and findings of the WUP-FIN Project into general conclusions and recommendations. The report argues that without primary studies and data collection it is impossible to draw conclusions of process behaviour (nature, society) that is necessary to reliably assess the diverse impacts of different development plans.

This report presents the main findings from all of the WUP-FIN activities and results: technical reports, working papers and publications that are available for studying the details of our field surveys, data analysis, model developments, socio-economic and policy analyses as well as impact assessment case studies. The report also brings the findings and recommendations into the discussion with experts, practitioners as well as with other stakeholders.

MRCS/WUP-A. 2003. Working paper 13 - Knowledge Base and DSF Application Software. Water Utilisation Project Component A (WUP-A): Development of Basin Modelling Package and Knowledge Base. Mekong River Commission, Phnom Penh.

This report gives an overview on the MRC knowledge base and DSF application. The DSF consist of three different models: SWAT hydrological model, IQQM water resources system, and ISIS hydrodynamic model. The SWAT and IQQM are applied to the lower Mekong basin while the ISIS has been applied to the floodplains downstream from Kratie in Cambodia.

Sarkkula, J., M. Keskinen, J. Koponen, M. Kummu, J. Nikula, O. Varis, and M. Virtanen. 2007. Mathematic modeling in integrated management of water resources: Magical tool, mathematical toy or something between? In *Democratizing water governance in the Mekong*, edited by L. Lebel, J. Dore, R. Daniel and Y. S. Koma. Chiang Mai, Thailand: Mekong Press.

This book chapter presents, drawing on examples from the Mekong Region, the ideas and suggestions on responding to changing user needs, model content and user interfaces as well as on increasing the linkages between modelling and other critical issues in water management. It is argued in the chapter that further work is needed on linking hydrological and environmental issues with social and economic activities to facilitate balanced modelling and impact assessment, and consequently, decision-making. This will require, according to the authors, multi- and cross-

disciplinary approach for both modelling and impact assessment, and better communication and interaction between modellers and non-modellers. This, in turn, would help to produce more transparent and relevant information, and creates stronger scientific and social basis for impact assessment and management decisions is argued.

Moreover, the chapter discusses the modelling activities in the Mekong driven by the following questions: What are the main questions in the Mekong Region that modellers are trying to answer? Why are these questions important? Is anybody coordinating the work or is the coordination needed? Why there are so many models? Is there something that the old models have not been able to answer, and if yes, why? Managers and planners don't actually need new models that are even more elaborated, but rather a single model that is simple but accurate enough: how this could be achieved?

Finally, the chapter provides a practical example of integrated modelling and impact assessment process through the application of the WUP-FIN models and analysis tools to the Tonle Sap system. The example also shows the need and justification of developing an advanced model system for this kind of complex hydrodynamic, environmental and social entity.

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Virtual hegemony: Donors’ preeminent role and limited influence in transboundary water governance of the Mekong

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Abstract

International donors have played an important role in shaping transboundary water governance in the Mekong for over half a century. However, formal governance practice and scholarship related to the Mekong has often overlooked the linkages between donor-driven, often regionally articulated programs, on the one hand, and nationally-defined policies and decision-making landscape, on the other. This missing linkage is often manifested in the non-adoption or non-application of donors’ development agendas at the national level as well as in the subversion of nationally-defined policies and development goals at the regional level. This article highlights the complex bureaucratic landscape which exists in the Mekong and the important role played by national government bureaucracies in shaping the actual significance of international donors’ actions and desires. It thus highlights the need to link transboundary water governance with the national-level decision-making reality, and vice versa, if regional programs are supposed to be translated into national-level policy formulation processes. From a scholarly perspective, it highlights the issue of bureaucratic competition and fragmentation in government bureaucracy, and questions academic approaches that tend to black-box the role of the state in transboundary water governance.

Keywords: transboundary water governance, spatial linkages, territorial space, government bureaucracy, international donors, Mekong

1. Introduction

Integrated Water Resources Management (IWRM), the notion of cross-sectoral coordination, has become a mantra in the discourse on water management paradigms despite major criticisms. These criticisms include critiques of the theoretical underpinnings of the IWRM concept, the emphasis on the need to integrate water management across sectors regardless of how key actors perceive this integration, and the plausibility of actually integrating all aspects of water resources management both institutionally and physically (e.g. Biswas 2004, Molle 2006, Allan 2003). Despite these criticisms[1], many donors have premised their support for the management of internationally shared (transboundary) waters in the developing world on the application of IWRM concepts.

In the case of transboundary water, the need for integration is argued not only across sectors, but also across scales, from local to supra-national. This need for integration stems from the assumption that sustainable water resources development and management can only be achieved through better coordination of the increasingly complex and multiple use of water (Phillips et. al, 2006). In the current application of these principles, the political processes and power dynamics involved in state and inter-state decision making are often overlooked or over simplified and the complex decision-making processes in transboundary water governance tend to be reduced to merely technical, managerial issues.

Together the assumptions on integration and the oversimplification of the cross-scale decision-making processes can result in a critical limitation of donors' actual influence on transboundary water resources outcomes. The history of water governance in the Lower Mekong Basin provides a case in point. There the role of international donors has been preeminent as evidenced in the formation of the Mekong Committee (MC) in 1957 and its later transformation into and operation as the Mekong River Commission (MRC) in 1995. Compared to other river basin institutions worldwide, the MRC is equipped with a comprehensive organizational structure to link regional and national development. Yet, the MRC has been unable to translate the outcomes of its regional programs into policy formulation at the national level. This appears to be due to a scalar disconnect between the regional and national-level decision-making processes.

This scalar disconnect in decision-making processes in part results from a neglect of national interests (Hirsch and Jensen 2006). They describe how water management

[1] See also Shah et al. (2001) on the limits to leapfrogging with regard to donors' attempt to transpose successful river basin management in the developing world.

measures at transboundary level could favor or disfavor countries' development interests depending on their hydrological position among other factors. For instance, while Vietnam (as a downstream country) will benefit from water quality monitoring of the Mekong, Thailand (as an upstream country) will see this monitoring exercise merely as a threat that could impede their national water resources development plan. Vietnam's Mekong Delta could also benefit from higher river flows in the dry season, while this would in all likelihood damage riparian forests around Cambodia's Tonle Sap. However, it should not be concluded that these well-known upstream-downstream interests reflect the only, or even defining, positions within each country.[2] For example, within all four Lower Mekong Basing (LMB) countries, each Department of Irrigations' interest to use physical infrastructure (dams and weirs) to regulate water flow for agriculture, and that of the energy sector to generate hydropower, conflict with Fishery Administrations' view of such structures as impediments to fish migration. Thus, accurate and realistic reflection of what actually represent a country's national interest, even if considered only at the formal government level, must also take into account complex domestic bureaucratic landscapes.

The missing linkages between national-level bureaucracies and transboundary decision-making processes brings to light a gap in much current analysis of international water governance. Transboundary water governance has been studied and analyzed from a variety of disciplines ranging from international law (McCaffrey 1997, Dellapenna 1994) to economics (Bhaduri and Barbier 2008), geography (Bakker 1999, Wolf et al. 2003) and institutions (Landovsky 2006, Raadgever et al. 2008). However, one common thread in the majority of this work until recently has been the often implicit assumption, that the State is the sole or primary actor in international relations. This focus on state interaction does not explain how states decision making at transboundary level stems from, or reflect, (bureaucratic) power interplay at the national level, and vice versa, (see also how Browder 2000 looks at state interaction in terms of upstream-downstream relationship[3]), as it tends to overlook the scalar relationship and interaction (regional, national, sub-national, local). Political geographers have provided tools for considering scalar issues in transboundary water governance in the analysis of spatial scale and its social production (Swyngedouw 2003, Marston 2000). In particular, they have examined how particular scales become constituted and transformed in response to socio-spatial dynamics and focused on processes and networks as a means of understanding the social production of scale. However, these tools have not yet been fully applied to provide insights on the issues described here, in particular the

[2] See also the way Hirsch and Jensen (2006) distinct national interest in transboundary water governance, as if such interest is derived from integration of state bureaucratic agencies at the national level.

[3] By focusing on upstream-downstream relationship Browder misses the greater picture of state interaction in transboundary water governance, and to a certain extent excludes the fact that regional cooperation can be achieved regardless of country's hydraulic position (which is very much evidenced by the current hydropower development plan in the Mekong).

linkages between national-regional decision-making in transboundary water governance, how these linkages are shaped by the national-level decision-making reality and framework, and how these linkages influence the overall process of problem definition at both regional and national level.

This article attempts to go beyond state-focused analyses of transboundary waters to include the role of international players and the implications of state level bureaucratic infighting. It investigates the prominent role played by international donors in designing the regional decision-making landscape within the Mekong River Commission (MRC) and compares it to the existing decision-making logic of formal national-level government institutions within the four countries of the Lower Mekong Basin. In doing so, it attempts to provide a better understanding of the role of the state in transboundary water governance by disaggregating the different elements of the state and bringing to light individual state's multiple and sometimes conflicting interests. The results suggest that river basin institutions would be better positioned to represent people's development aspirations, or better equipped to broaden what Molle (2005) argues as their *'narrow path to influence'* when they are better connected to the decision-making reality at the national level.[4]

We focus here on the development of complex relations in transboundary water governance practices, and thus do not limit our analysis of transboundary decision-making processes to its formal/legal context only (in the form of formal agreement, legal documents and official reports). As part of our study we synthesize key actors' positions and their diverse, sometimes conflicting perceptions of national-regional development linkages. At regional level, these key actors consist of both international and riparian staff of the MRC Secretariat in Vientiane, officials of the National Mekong Committees (NMCs) from the four Lower Mekong Basin countries, and prominent international donors (such as the World Bank, the Asian Development Bank, the Swedish International Development Agency/SIDA, and the Australian Agency for International Development/AusAid). The World Bank has long played an important role in shaping MRC program components, in particular through its Water Utilization Program (WUP) and, currently, through the Mekong IWRM program, in collaboration with ADB and AusAid. Similarly, SIDA can be considered as one of MRC's major donors. Together with Danish International Development Agency (DANIDA), SIDA provides funding for MRC Basin Development Program and Fisheries Program.

At the national level, we approached relevant sector ministries in each of the four countries. In the Lao PDR, we examined the structural problem of the formation of an inter-ministerial/cross-sectoral coordination body through our interviews with key actors from both the Water Resources Environment Administration (WREA) -the agency assigned with the coordination task- and the more established, prominent

[4] The critical hydropolitics perspective (Sneddon and Fox 2006) argues that transboundary water governance should not be monopolized by state actors, but should ensure the inclusion of aspirations and opinions of non-state actors living in the basin. Yet, critical hydropolitics literature seems to assume that centralized decision making in river basin institutions stems from the integration of state ministries and agencies at the national level (Miller and Hirsch 2003).

sector ministries such as the Ministry of Agriculture and Forestry (MAF) and the newly formed Ministry of Energy and Mines (MEM). From these interviews, we learned that sector ministry's ability to resist WREA's coordination role is rooted in their sectoral decision-making authority, rather than in their bureaucratic establishment as such.[5] In Cambodia, we focused our interviews on key actors from the Fishery Administration, taking into account the sector's importance in the country's water resources development as well as for the region's capture fisheries resources.

In Vietnam, we synthesize the implications of bureaucratic competition for transboundary decision making from our interviews with key actors from Ministry of Natural Resources and Environment (MoNRE) and Ministry of Agriculture and Rural Development (MARD) focusing on their overlapping bureaucratic domains. In Thailand we focused our interviews with key actors from the Electricity Generation Authority of Thailand (EGAT) and Royal Irrigation Department (RID). The former plays an important role in shaping the region's waterscape with regard to hydropower development. The latter plays an important role in promoting the idea of inter-basin water transfer in the region, and to a certain extent in pointing to the need to formulate water allocation rules at transboundary level (Molle and Floch, 2008). In addition, we also include opinions and insights of prominent civil society groups and non-governmental organizations in the region to strengthen our overall analysis.

To demonstrate that the current scalar disconnect in transboundary water governance of the Mekong is partially rooted in the institutional discrepancy between regional and national decision-making landscape, we first highlight how organizational structure of the Mekong River Commission Secretariat (MRCS) was designed towards the application of IWRM concept, how this design requires the establishment of a well-functioning inter-ministerial/cross-sectoral platform at national level, and how the MRC attempts to fulfill and fails to do so in section 2. In section 3, we show that the current institutional set-up to manage transboundary water resources at the regional level as reflected in the organizational structure of the MRCS and how this is duplicated into the National Mekong Committee Secretariat (NMCS) does not comply with the national-level decision-making landscape, reality, and the logic behind it. We argue that current failure to coordinate sector ministries' development activities at the national level is rooted in the fact that such coordination is entangled with the issue of regulation, which involves reshaping of bureaucratic power relationship between the different ministries. In section 4, the current deadlock in transboundary water governance of the Mekong is then put into the context of these two scalar disconnects, both vertically (between MRC and national government bureaucracies) and horizontally (between different sector ministries at national level) to show that donors' tendencies to impose their development idea into the MRC has not yielded to donors' power to influence national-level decision-making processes. In the concluding section, we reflect on

[5] Unlike MEM, WREA has been less successful in developing its bureaucratic importance, despite the fact that WREA was formed only one year later after MEM.

lessons learned from transboundary water governance in the Mekong and their broader significance for river basin institutions worldwide.

2. The Mekong River Commission and international donors' interests in IWRM

In this section, we illustrate the way the Mekong River Commission Secretariat (MRCS) organizational structure and activities are set up through program-based approach, derived primarily from international donors' interests towards the application of IWRM concept. We describe MRC's strategy to address the issue of cross-sectoral coordination at national level through the shaping of the national consultation meetings as an embryo of inter-ministerial/cross-sectoral decision-making platform and how it fails to do so.

The formation of a river basin institution as a platform for regional cooperation in the Mekong dates back to 1957 with the establishment of the Mekong Committee (MC) under the auspices of the United Nations Economic and Social Commission for Asia Pacific (UN-ESCAP). In 1995, following the signing of the Mekong Agreement, the MC was transformed into the Mekong River Commission (MRC).[6] Like the MC, the MRC comprised of the governments of Lao PDR, Cambodia, Thailand, and Vietnam.

Institutionally, the MRC is added with a policy-making body, the Council, which comprised of four members at the level of a minister from the four countries. Under the Council, there is the Joint Committee (JC) which acts as the operational decision-making body at the MRC. JC members are comprised of director generals from the respective ministries. In addition, the MRC has its Secretariat (MRCS) as its technical, operational unit, which consists of different programs funded by different international donors and run by both international and riparian staff. Outside the organizational structure of the MRC, there is the National Mekong Committees (NMCs) that supposed to link MRC's regional programs with sectoral ministries' development plans and policies at the national level. Like the MRC, in its day-to-day operation, each NMC is equipped with a secretariat (NMCS) whose role is to discuss regional development plans with different/relevant sectoral ministries at the national level. At present, the NMCs have their secretariat located in their respective Ministry of Natural Resources and Environment (MoNRE), with the exception of Lao PDR, where the Lao NMC has been recently incorporated into the Water Resources Environment Administration (WREA).

The United States's withdrawal from the MRC and shifted international development trend in water resources management towards sustainable development as raised by the World Commission on Environment and Development (WCED) and convened by the United Nations in 1983 result in MRC's changing role as envisioned by its donors. Unlike before, the MRC relied primarily on European donors (such as the governments of Denmark, Sweden, Finland, Netherlands, Belgium, Germany, France), Australia and the World Bank for its program.[7] These donors placed greater

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[6] See Radosevich (1995) on negotiation process concerning this organizational transformation.

[7] Though diverse in their approach and mode of operations, these donors shared common characteristics in the way they perceived the MRC as their organizational

emphasis on the application of IWRM concept as the foundation of MRC's organizational functioning, focusing on environmental aspect of development, rather than on the region's development potential (in terms of irrigation, hydropower, navigation and flood protection).[8] This focus on environment became evident from the inclusion of the concept of sustainable development in the 1995 Mekong Agreement and the formation of the Environmental Program (EP) as one of the MRC's cross-cutting programs in 2001 (Jacobs 2002). The program included environmental monitoring and assessment, water quality studies, as well as studies on aquatic ecosystems. Besides, following the signing of the 1995 Mekong Agreement, hydropower program was abolished at the MRC and only reestablished and became active in 2007 with the channeling of funds from the Government of Finland and Japan. MRC's re-involvement in hydropower development is driven primarily by the rapid speed of development in the sector (due to the increasing role played by the private sectors) (Middleton et al. 2009). At the same time, the Fisheries Program (FP), (especially capture fisheries research) received greater attention from international donors, in relation to its role in sustaining the river's rich biodiversity and later with regard to its role in ensuring the region's food security. Under the MRC IWRM application is focused on international donors' effort to preserve the environment within the context of sustainable development.

Donors' changing perception towards development reshaped their strategies in promoting regional development and how they perceive MRC's role in it (MRC Annual Report, 1996, 1995). In line with this change donors attempt to reshape MRC's role from a development agent (to channel donor funds to the country) to become more of a regional body that promotes sustainable development and a regional knowledge centre that promotes information sharing and knowledge accumulation in the field of water resources management through the application of IWRM concept.[9]

MRC's changing role as envisioned by its donors is reflected in the MRCS/NMCS organizational structure. Following the formation of the MRC in 1995, international donors shifted their development focus from national projects implementation towards the establishment of regional research programs. This shift was evident with

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means to promote their idea of development in the region (notes from International Donor Meeting in Vientiane, 19 June 2009).

[8] During the Mekong Committee IWRM approach had been applied primarily in relation to proposed/planned basin-wide development (with regard to irrigation, hydropower, flood protection) (Mekong Committee Annual Report, 1961). Similarly, attention to social and environment impact of development was already given during the Mekong Committee era (see the report on economic and social aspects of lower Mekong development prepared by the Ford Foundation mission in 1962). However, these aspects received a much greater emphasis within the MRC.

[9] In practice, however, one could argue that MRC's organizational perspective has not changed much apart from the fact that its development role is now taken over by national budgets and private companies. Nevertheless, with this projection in mind, donors' effort is focused on strengthening the different programs at the MRC Secretariat, and less on how these programs can eventually be implemented at the national level.

the introduction of Basin Development Program (BDP), Environment Program (EP), Information and Knowledge Management Program (IKMP), and Integrated Capacity Building Program (ICBP) as MRC's cross-cutting programs in 2000 (MRC Strategic Plan 2001). Prior to 2000, MRCS was comprised of different project activities (ranging from policy and planning, irrigation rehabilitation, watershed assessment, reservoir fisheries, flood forecast, to capacity building), funded by different international donors, formulated and implemented separately from each other.[10] One major consequence of this transitional approach from 'project' to 'program' is the fact that development funds from donors are allocated primarily to support MRCS research programs focusing on regional water management issues, with sectoral ministries receiving only a small portion of the funds. [11] Unlike before, where the MC played an important role in ensuring development fund channeling to the country in the form of planning, studies, but most importantly also in the form of concrete project implementation, at present donors primarily channel their funds to MRCS programs with limited interest for projects at the country level[12].

With the transition from 'project' to 'program' approach, MRC activities are designed referring to the programmatic classification of its secretariat. As shown in figure 1, the MRC Secretariat (MRCS) comprised of different programs divided into four divisions: Environment, Planning, Technical Support, and Operations with each country's representative positioned as a division head. Each program is led by a regional program coordinator (riparian staff) and a chief technical advisor (international staff). Similarly, the way NMCS' role was designed to support MRCS work and act as its organizational links to consult and to a certain extent translate its program components into the national level, rather than to represent sector ministries' development interests at the regional level NMCS is reflected in the duplication of NMCS organizational structure. The duplication is most apparent in the case of the Lao National Mekong Committee Secretariat (LNMCS) (figure 1).

[10] In practice, the transitional approach from project to program does not automatically result in integration of project activities within one program especially when funding for these projects came from different donors.

[11] Having said this, recently donors such as the World Bank have started to link regional studies with country-level project implementation in the Mekong Integrated Water Resources Management (M-IWRM) program.

[12] This does not mean, however, that donor could not channel their funds directly to the country through bilateral agreement as conditioned by the current political system in the region used to be absent in the past.

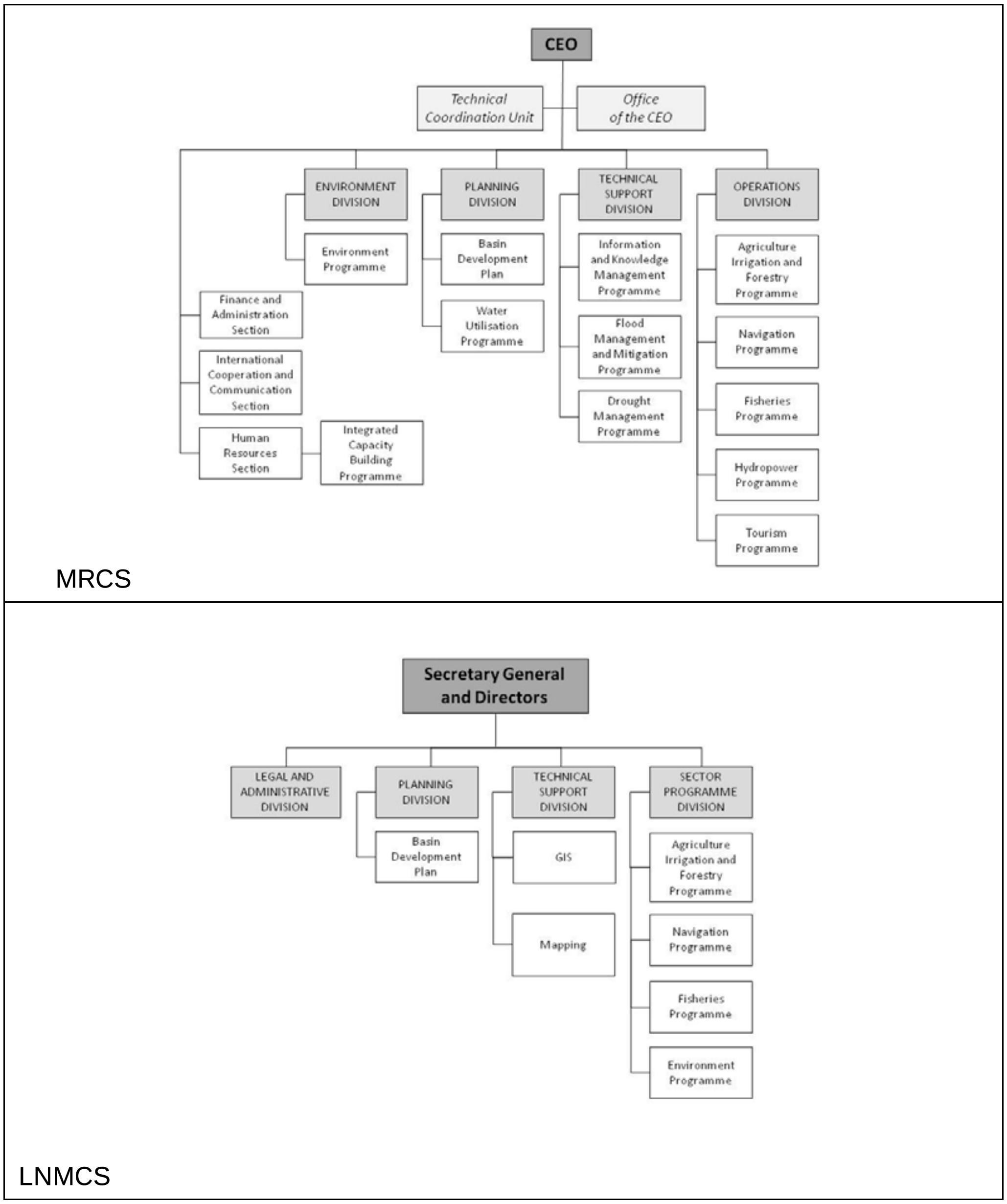

Figure 1: Overview of MRCS and LNMCS organizational structure

The way the National Mekong Committee Secretariat (NMCS) organizational role is designed to translate MRCS program activities to national ministries assumes that a well-functioning inter-ministerial/cross-sectoral decision-making platform does exist or could be set up at national level regardless of the political aspects in IWRM concept and how sectoral ministries actually perceive the need for integration in the first place. International donors and MRCS staff expected the NMCS not only to link/consult MRC's cross-cutting program components to relevant sectoral ministries[13] during the national consultation meetings, but also intended to shape, by design or by default, the role of these meetings as an inter-ministerial decision-making forum at national level. Unlike before when the national consultation meetings[14] acted as a forum for NMCS staff to consult and discuss MRCS (sector-based) project activities with particular sectoral ministry, at present, the programmatic classification of the MRCS requires NMCS staff to compile sectoral ministries' development plans and coordinate their development activities if MRCS program activities are supposed to capture cross-sectoral development interests and linkages at national level. This requirement is most apparent with regard to MRCS cross-cutting programs. For instance, the formulation of basin development plan by the BDP requires participation and involvement from different sectoral ministries (with regard to irrigation, fisheries, hydropower, industry, trade, and planning). Similarly, EP's component on river health monitoring requires cooperation with other sectoral ministries (such as the Ministry of Industry, Ministry of Energy and Mines, Ministry of Agriculture and Forestry) next to the Ministry of Natural Resources and Environment (MoNRE).

In practice, however, as donors' current efforts are focused on designing MRCS program activities following the basic principles of IWRM concept regardless of sectoral ministries' development interests, sectoral ministries fail to see how they can benefit from their relationship and interaction with the NMCs during the national consultation meetings.[15] As mentioned by the National Mekong Committee

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[13] This includes all existing sector ministries which have water-related development activities. The exact composition of these ministries varies in each country. In Lao PDR in particular, it includes Ministry of Agriculture and Forestry or MAF (particularly Department of Irrigation but not limited to it); Ministry of Energy and Mines (MEM); Ministry of Planning and Investment (MPI); Water Resources Environment Administration (WREA); Ministry of Public Works (MPW) and Ministry of Industry and Trade (MIT). In Vietnam, it includes Ministry of Natural Resources and Environment (MoNRE); Ministry of Agriculture and Rural Development (MARD); Ministry of Industry and Trade (MIT); and Ministry of Planning and Investment (MPI). In Cambodia this includes Ministry of Environment (MoE); Ministry of Industry Mining and Energy (MIME); Ministry of Agriculture Fisheries and Forestry (MAFF); Ministry of Water Resources (MoWRAM); and Ministry of Planning and Investment (MPI). In Thailand, it includes Ministry of Natural Resources and Environment or MoNRE (the Department of Water Resources in particular); Royal Irrigation Department (RID); Ministry of Energy; and Ministry of Public Works (MPW).

[14] The national consultation meetings as a forum to coordinate and link regional development initiatives with national-level development plans already existed back in 1957 following the formation of the Mekong Committee during the same year.

[15] In general, MRCS program activities are focused on regional research which does not necessarily capture or include country's development interest into it. The way the Fisheries Program focuses its research on capture fisheries, vis-à-vis country's interest in aquaculture can be used as an example here. Similarly, study on multiple

Secretariat staff from Cambodia: *"At present NMCS found it very difficult to arrange the national consultation meeting because the meeting could not give any tangible benefit to sector ministries"* (interview with CNMCS staff, October 2009).

Our interviewees at the MRCS and NMCSs as well as sectoral ministries consistently reported that in most cases, key decision-makers from sectoral ministries will not join the national consultation meeting. As stated by key informant from the MRCS: *" Sectoral ministries' lack of interest to attend the national consultation meeting is made obvious by the fact that they send their least experienced and junior staff to one consultation meeting after the others, regardless of the meeting's agenda"* (interview with MRCS staff, September 2009). Though present at the meeting, these junior staff can hardly represent the position and development point of view of the sectoral ministries. As expressed by NMCS staff from Vietnam: *"In some cases, these staff did not even know what the meeting is all about, even after elaborate explanation from NMCS/MRCS staff"* (interview with VNMCS staff, June, 2009). [16] Hence, in general, the consultation meeting will be led and dominated mainly by the national program coordinator (NMCS staff), with limited or no involvement from the sectoral ministries staff.

In turn, the national program coordinator will arrange his/her country's approval for MRCS program activities mainly through their personal relationship with key decision makers at the sector ministries, or directly with the representative in the Joint Committee, regardless of the points discussed during the national consultation meeting. In this context, one country's approval of MRCS program seems to be rooted in whether or not the country can tolerate donors' development agenda, rather than based on the motivation to translate and implement the program activities at the national level. A country would in most cases approve MRCS program activities as long as these activities do not threaten their national development interests. However, when the country realized that the activities could potentially disturb their national development objectives, they would then use the national consultation meeting as their means to halt the effort. This strategy is most apparent in the way LNMC and CNMC postponed national consultation meeting, and thus delayed MRC's most recent effort on conducting Strategic Environment Assessment (SEA) for the 11 mainstream dams in the Mekong.

3. National-level bureaucratic landscape as an integral part of transboundary water governance

In this section we argue that the existing bureaucratic complexity at the national level, on the one hand, and the simplified donor-driven regional design of the MRCS, on the other, are the main factors hampering the National Mekong Committees'

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benefits of paddy field as promoted by the Agriculture Irrigation and Forestry Program does not reflect country's agricultural policy towards agricultural intensification and irrigation expansion.

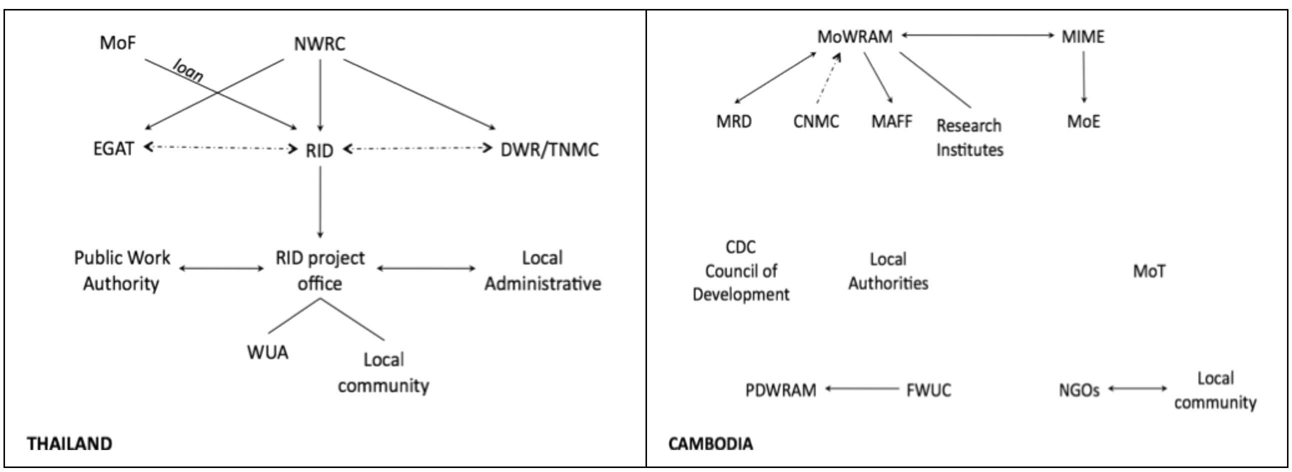
[16] Hence, MRCS staff often referred them as meeting 'decoration' rather than meeting participants.

abilities to fulfill their coordination roles. The first part of the section discusses the fact that the designed role of the National Mekong Committees as MRC's key linkage to sectoral ministries does not fit the existing bureaucratic logic and decision-making reality at the national level. After that we highlight the structural problem in the formation of inter-ministerial coordination body, illustrated by the bureaucratic challenges faced by the recently formed Water Resources Environment Administration (WREA) in fulfilling its coordination role vis-à-vis sector ministries' interests to sustain their sectoral decision-making authority in Lao PDR. In the end of the section we discuss how bureaucratic competition and fragmentation shaped NMCs' functioning and their organizational characteristics.

3.1. National consultation meetings vis-à-vis national-level decision-making landscape and reality

The way the MRC attempts to address the issue of cross-sectoral coordination in IWRM application through the reshaping of the role of the national consultation meetings does not coincide with the logic behind the current absence of sectoral integration at national level, and thus the fact that individual sectoral ministry's development goal in the four LMB countries is rooted in their bureaucratic interests to sustain their sectoral decision-making authority rather than to transfer this authority to NMCs or any other government agencies assigned with the coordination task.

As shown in figure 2, water resources management in the four LMB countries is hardly a domain of one particular ministry.



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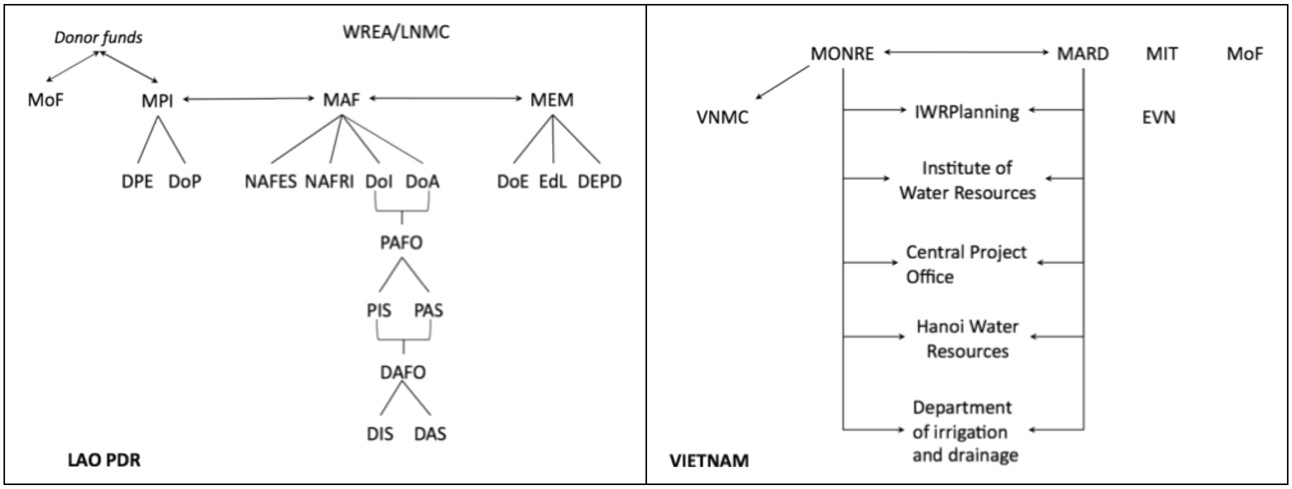

Figure 2: Overview of bureaucratic actors in water resources management in the four LMB countries.

Source: Challenge Program for Water and Food workshop in Vientiane, 4-6 May 2009.

In theory, from the perspective of IWRM as a 'neutral' management concept (refer to donors' report), this should not pose a problem to NMCs' coordination efforts. In reality, however, the establishment of an inter-ministerial coordination body is often overlapped with the issue of regulation. The establishment of ministries for the natural/water resources and environment is frequently associated with the principle of setting up a governmental body in charge of regulation. Regulation is supposed to embody principles of fairness, environmental sustainability, and economic soundness. In principle, sector ministries and their activities associated with social and environmental impacts, should be regulated by an independent body. This task is generally entrusted (or is expected to be so in principle) to the ministry of natural/water resources and environment. Not surprisingly, this creates conflicts between ministries for natural/water resources and environment and sector ministries (see illustration in next section). Regulation obviously involves overall restructuring of the power relationships between the different sector ministries. In order to regulate sector ministries' development plans, one needs a real authority as on how to regulate their role in water resources management in the first place. In this context, the authority to regulate becomes something that generates heavy bureaucratic infighting. The implication of such competition is that the coordination role of the NMCs, which come under ministries for natural/water resources and environment, is not well accepted things its frontier with regulation is unclear.

Formally, sectoral ministries have representatives in the National Mekong Committees. In the case of Vietnam NMC, four (sectoral) ministries are represented[17]. Yet, this formal membership did not automatically result in the VNMC's ability to coordinate sector ministries development activities in accordance with the MRCS program as it lacks the authority to regulate. As expressed by NMC staff from Cambodia: *"NMCs cannot (re)direct sector ministries' development activities as their role is only to coordinate. Yet, it is very difficult to coordinate sector ministries' development activities when they also lack decision-making authority at the inter-ministerial level"* (interview with CNMC staff, October 2009).

Similarly, the Joint Committee's (JC) and the Council's approval of MRCS program components does not mean that these components are in line with sector ministries' development interests. Lacking the power to regulate, the JC and the Council hardly function as an inter-ministerial decision-making platform, despite the fact that (sector) ministries are formally represented within both the JC and the Council.

Moreover, NMCs' coordination role is challenged by bureaucratic competition between sectoral ministries, regardless of how these ministries view the coordination role of the NMCs.[18] Bureaucratic competition[19] between sector ministries takes place in terms of decision-making territory and access to development funds. The very idea of inter-ministerial coordination does not coincide with the general interest of government bureaucracy to sustain the status-quo, where each ministry's decision-making authority is defined based primarily on its sectoral role and where distribution of funds to each sector ministry has been prearranged nationally, as well as through each ministry's relations with international donors.

3.2. WREA formation and the structural impediment in establishing inter-ministerial coordination bodies

The issue of regulation as the structural problem in establishing inter-ministerial coordination bodies becomes most apparent in the way the Water Resources Environment Administration (WREA) struggles to fulfill its designed coordination role. Following the formation[20] of WREA in 2007, the Lao National Mekong Committee

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[17] These ministries are: Ministry of Planning and Investment (MPI), Ministry of Natural Resources and Environment (MoNRE), Ministry of Agriculture and Rural Development (MARD) and Ministry of Foreign Affairs (MoFA).

[18] For Lao PDR in particular, ADB's effort to form a national-level river basin organization through its Nam Ngum River Basin project has not yielded any result in terms of promoting an inter-ministerial decision-making platform. Until now, Lao PDR still does not have any river basin organization, though ADB is planning to fund the second phase of the project.

[19] Goldensohn (1994) defines this bureaucratic competition as sectoral egoism, in which each sector ministry concerns primarily with its own sectoral development perspective and goal and views cross-sectoral coordination as potential threat for their sectoral decision-making authority.

[20] WREA formation was primarily driven by both the ADB and the UN under the context of Governance and Public Administration Reform (GPAR) program (ref). With this merger the LNMC Secretariat staff was used to fill different vacant positions in WREA, and the Secretariat was left with only 5 staff.

(LNMC) was incorporated into its Department of Water Resources (DWR). Consequently, LNMC's role to coordinate sector ministries' involvement in relation to MRCS program shifted to WREA or to be precise, to the DWR. From the MRC's point of view, WREA formation could potentially serve as inter-ministerial coordination body, and thus as its regional-national development linkages[21]. In practice, the formation of WREA did not automatically result in the establishment of an inter-ministerial decision-making platform or better coordination on water resources management among sectoral ministries. Currently, WREA is struggling to define its role in water resources management, vis-à-vis sector ministries' interest to retain their sectoral decision-making authority. Formally, the WREA role was to coordinate water resources management at a national level, through its interaction with sectoral ministries such as the Ministry of Energy and Mining (MEM) with regard to planning hydropower development, Ministry of Industry and Trade (MIT) with regard to the treatment of industrial waste, as well as with the Ministry of Agriculture and Forestry (MAF) with regard to agricultural (including livestock and fishery) and irrigation development. In practice, none of these sector ministries has actual working relationships with the WREA apart from their involvement in meeting/discussion forums arranged by the WREA to formulate its water resources development policy[22]. Further, parallel to this formulation, the Department of Irrigation (DoI) under MAF is formulating its new irrigation sub-sector strategies as a means to protect itself from WREA's potential domination. Like WREA's water resources policy strategy, the irrigation sub-sector strategy[23] adopts a broader approach to water resources management, not limited to irrigation. Likewise, planning of hydropower development and mining rests with MEM, with little influence of WREA.

WREA's inability to counteract sector ministries' interests in sustaining their decision-making authority became evident in the way WREA's role in formally approving Environment Impact Assessment (EIA) submitted by sector ministries has been reduced to a merely a bureaucratic formality. With reference to the Environment Law of 1999 (which is now under revision), sector ministries are expected to conduct an EIA for their proposed and planned development activities. Prior to WREA formation, sector ministries were entitled to approve their own EIAs. With the formation of WREA, sector ministries are required to submit EIAs to WREA to be reviewed prior to

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[21] In practice, the formation of WREA removed the confusion over which ministry should be included in the MRCS BDP program.

[22] This policy is scheduled to be finalized at the end 2010 and will clarify WREA's role in water resources development vis-à-vis other sector ministries. The ongoing formulation process of WREA's water resources development policy reflects WREA's position with respect to other sector ministries that may be in question.

[23] With reference to this sub-sector strategy, the DoI would enhance its connection with other sector ministries (such as with the Ministry of Energy and Mining especially on multi-purpose reservoirs for hydropower and irrigation; the Ministry of Industry and Trade in creating markets for agriculture product; and the land management authority) as a strategy to improve irrigated agriculture and irrigation development in general.

their approval. In practice, however, WREA has the tendency to approve the EIAs reviewed by sector ministries regardless of quality. Following the submission of EIAs, WREA would arrange a meeting with relevant sector ministries to discuss them. Yet, in general, everyone seemed to have a common agreement and understanding that the EIA should be approved as soon as possible so that it would not delay the planned/proposed development. As said by a consultant involved in EIAs approval process: *"Both WREA and sector ministries are obliged to do an EIA as it is part of the formal procedure to proceed with the proposed development. However, the way they conduct the EIA reveals how it has become a symbolic exercise to get the needed certificate to withdraw the money"* (interview with EIA consultant, August 2009).

The present situation of granting approval to sub-standard EIAs[24] reflects the interplay between WREA and sector ministries in their bureaucratic position and authority. Projects generate benefits to the bureaucracies in charge, and there is no reason why this would stop at the door of WREA. Sector ministries effectively accept WREA's formal responsibility as long as this does not affect their sectoral development activities. Similarly, WREA accepts the need to approve sub-standard EIAs as long as it maintains its formal role in water resources management.

This situation is not specific to Laos. Molle and Hoanh (2009) had described the bureaucratic struggle between MoNRE and MARD in Vietnam. Bureaucratic struggle around the establishment of river basin organizations is linked to the attempts by MoNRE to play some role in regulation and to have a say in planning of infrastructure. Similarly, in Thailand, the Royal Irrigation Department is at loggerheads with the MoNRE. These conflicts obviously have a bearing on the capacity of the NMCs to articulate and coordinate national policies and their link with the regional level.

3.3. National Mekong Committees: A coordination body quasi sector ministry?

Lacking power, the NMCs could use access to development funds as their means to ensure sector ministries' compliance towards MRCS program. In practice, however, within the organizational context of MRC, the NMCs' power to channel donor funds to sector ministries has been reduced significantly, following donors' changing approach to channeling the funds to the MRCS, rather than to sector ministries in each country. In this context, NMCs' decision-making authority remains marginal, limited to its role as a gatekeeper for sectoral projects which have to be made compatible with regional agreement.[25] Hence, the NMCs are forced to find other alternative sources of funding, outside the organizational context of the MRC, to elicit sectoral ministries' compliance. This strategy is rooted in the fact that within the government

[24] In some cases EIA for two different roads in two different provinces (not neighboring to each other) are written and formulated in exactly the same language, using the same wording.

[25] Apart from donor funds, NMCs received a small amount of budget from both the MRCS and governments of the LMB countries for its administrative expenses. Yet, this fund could hardly be used as a means of compensating its lack of authority.

bureaucracies, access to funding is often perceived as access to decision-making authority, and vice versa.[26] Yet, to access such funds, the NMCs have to develop their role beyond their coordination task, with the risk of under prioritizing the task.

For instance, LNMC received funding from the Swiss Development Cooperation (SDC) to develop a socio-economic atlas for Lao PDR. In addition, it was the executing agency for a World Bank funded study on possible water transfer across the Thai-Lao border. Quite surprisingly, LNMC did this study without any connection with the MRC, despite the study's transboundary nature. The LNMC has also implemented an embankment protection project with the funding from the government of Belgium. Similarly, TNMC is involved in River Basin Organization project at national level, while both CNMC and VNMC are involved in different project negotiations between donors and sectoral ministries. Furthermore, NMCs staff often received consultancy assignments from sectoral ministries, outside the context of MRC.

In the end, operating as new bureaucratic bodies, it is no longer clear whose bureaucratic interest and development perspective the NMCs represent. For instance, in the case of MRC Basin Development Program (BDP), the TNMC's position on hydropower development does not represent the interests of the Electricity Generation Authority of Thailand's (EGAT), the main actor in the sector development. Similarly, operating as a coordination body without any power to regulate, NMCs' positions on certain issue is confused by sector ministries' different and sometimes conflicting interests. For example, in the case of MRC Strategic Environment Assessment (SEA) for 11 planned hydropower dams on the Mekong mainstream, CNMC's position was confused due to the antagonism between the Ministry of Industry Energy and Mines' (MIME) interest in hydropower development and the Fisheries Administration's concerns for fish migration.

At the organizational level, NMCs' characteristic as a new bureaucratic agency is also evident from the way they use their role in the overall recruitment process of MRCS riparian staff as a means to spread their line of patronage, and thus preserve and reproduce their bureaucratic existence[27]. Formally, NMCSs are responsible for the first selection process (short-listing the potential candidates) for any available position for riparian staff at the MRCS. In practice, this process of short-listing the potential candidates is not always conducted based on the candidates' qualifications. Often, a candidate is shortlisted because s/he has good connection with NMCSs staff in charge of the selection process. As expressed by MRCS staff: *"NMCs often reserve certain position for certain candidate they favor without putting much emphasis on quality control"* (interview with MRCS staff, June 2009). In addition, it was reported by MRCS riparian staff: *"We have to pay a certain amount of financial contribution to the NMCSs. NMCSs will use this contribution to support their operational functioning"* (interview with MRCS riparian staff, August 2009).

4. The power to fund and the fallacy of donors' hegemonic tendencies

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[26] At personal level, this bureaucratic logic to acquire access to funding as a means to ensure decision-making authority often reflects the practice of bureaucratic corruption (see also Suhardiman and Mollinga, 2010).

[27] See also Wade (1982) on the market of public office.

In this section, we argue that donors' ability to provide funding to the MRCS does not necessarily result in the shaping of MRC organizational functioning in accordance to donors' development idea/agenda. On the contrary, donors' tendencies to impose their development agenda in the overall shaping of MRCS program component, on the one hand, and their inability to ensure the adoption and application of these agenda both at regional and national level, on the other, shows donors' limited power to influence vis-à-vis their assumed powerful position as development funds provider. Firstly, we highlight donors' hegemonic tendencies in the overall shaping of the MRCS program design as well as the Secretariat's dependency towards donors' funds. Secondly, we bring to light MRC's marginal role in shaping transboundary water governance of the Mekong as a result of current scalar disconnect of and institutional discrepancy between regional and national-level decision-making processes and framework.

Donors' hegemonic tendencies in the overall shaping of the MRCS program component are reflected in the way certain aspects of transboundary water governance in the Mekong are distinguished as issues and non-issues based on donors' development idea. This strategy is most apparent from the way the funding for hydropower development was halted (even after the formulation of the 1994 hydropower master plan) when donors perceived it as a threat for the region's biodiversity and livelihoods, and focused on capture fisheries research instead. In this context, but for a short period only, hydropower development became a non-issue, as environment protection grew in prominence. Similarly, the overall content of the Basin Development Program (BDP) and Environment Program (EP) very much resembles donors' development perspective on integrated water resources management, biodiversity, wetlands preservation and environmental monitoring as perceived by the majority of MRCS riparian staff. Though one could argue that the current format of the BDP is rather developmentalist (which in itself reflects countries' resistance to donors' environmental focus), the fact that the countries and the MRCS undertook the whole BDP exercise knowing that there was little chance that donors would agree on the same magnitude of development activities as proposed earlier in the 1970 Indicative Basin Plan, shows that this exercise remains rooted in donors' commitment to have the MRC produce a basin development plan for the Mekong, rather than in the countries' motivation and need.

Donors' hegemonic tendencies in the overall shaping of MRCS program are somehow justified by the MRC Secretariat's dependency towards donor funds for its overall functioning. MRCS staff opted for a top-down approach, where development proposals were formulated by a limited number of people (mostly international staff and consultants), who were familiar with donors and their development frames. In this way, it is easier for them to secure funding primarily to be allocated to the Secretariat (mainly for regional research purposes), than when they have to approach each sectoral ministry in the four LMB countries to consult them about the proposal formulation in the first place. In the words of one of MRCS staff: *"If each sector ministry would have to deliver its own development proposal at the country level, they would have come with very different development ideas. Similarly, each country would have come with a different set of development approaches due to their different development stages. In this context, the formulation of development proposals would have not been cost effective from the MRCS staff's point of view"* (interview with MRCS staff, July 2009).

In practice, almost fifteen years after its formation, the MRC still lacks any basin development plan, as envisioned by its donors. MRCS program activities have limited if no actual significance in influencing the overall water resources development direction at the country level.[28] This limitation was consistently acknowledged by both international and riparian staff of the MRCS. As stated by one MRCS riparian staff: *"There is no ownership from the countries towards concepts and programs introduced and proposed by donors as the program was designed without taking into account how the four countries will cope with it and whether (or not) the countries perceive it to be useful to adopt the idea"* (interview with MRCS staff, April, 2009). This problem of lack of ownership is also acknowledged by MRCS international staff. As expressed by one of them: *"Until today donors continued to pay the salaries of the field staff who monitor the water level along the river. Riparian countries refused to pay the staff salary because they perceive the data measurement as something that is requested by donors or the MRCS rather than something that is needed or demanded by the countries"* (interview with MRCS staff, April, 2009).

At the program level, the possibility for the development scenarios formulated by MRC Basin Development Program (BDP) to be used by sector ministries in the four countries depends highly on whether it could incorporate and synergize different sector ministries' development perspectives. Further, it is unclear how countries see the role of MRC Integrated Knowledge Management Program (IKMP) in promoting knowledge sharing when data collection is driven primarily by donors' development idea rather than focused on countries' needs. As stated by an official from Department of Irrigation in Lao PDR: *"We do not know why MRCS always asked sectoral ministries staff to collect all kind of data and for what purpose"* (interview with official from Department of Irrigation in Lao PDR, September 2009). Similarly, it is unclear how MRC Environment Program (EP) components can be translated into sector ministries' development activities, bearing in mind its highly technical and environment-focused character. As expressed by one MRCS staff: *"Riparian staff and sector ministries could hardly understand how and why they should apply theoretical concept such as environmental flows in the Mekong. When donors and international consultants talked about the need to maintain a minimum flow in the Mekong mainstream, the countries questioned how this minimum flow can be measured in the first place"* (interview with MRCS staff, June 2009). In addition, the question remains whether the Fisheries Program's (FP) strategy to ensure sector ministries' involvement in its program components (by including sector ministries' development interests in aquaculture next to donors' interest in capture fisheries research) can be considered as successful, bearing in mind that these two program components are running in parallel, rather than complimentary to each other.

In recent years, the MRC's role in shaping transboundary water governance in the Mekong became even more marginalized by the emerging importance of development banks, construction firms, and other private companies. For instance, the Asian Development Bank (ADB) introduced in 1992 the concept of Greater

[28] This is consistent with the findings of Dore and Lazarus (2009) who illustrate MRC's marginal role by presenting cases in which countries evidently shaped transboundary water management in the Mekong through bilateral agreements outside the context of the MRC.

Mekong Sub-region (GMS) to move even beyond the basin level.[29] Focusing on the need to establish sub-regional economic cooperation (generally through but not limited to infrastructure development) the initiative gained momentum during the late 1990s/early 2000s. The way the ADB GMS initiative sidelines the MRC's role in transboundary water governance is most apparent from its current effort to formulate a regional power trade network, focusing on hydropower development in the region (RETA 6440). Based on the interconnectivity approach (that is, to connect power producer to consumer) the ADB's regional power trade plan indirectly favors the construction of 11 planned hydropower dams on the Mekong mainstream as the most effective means, from an engineering point of view, to promote economic growth in the region, regardless of the outcomes of MRC Strategic Environment Assessment. Similarly, the emerging importance of private developers in the region does not leave MRC or its donors with much room to influence the actual shaping of transboundary waterscape (Middleton et al. 2009). Financially self-sufficient, these developers can collaborate with national governments to conduct all forms of development (hydropower, mining, industry) at the country level, regardless of whether or not such projects will have any transboundary effects to any specific country or to the region as a whole. As an example of the magnitude of this activity, there are now 110 hydropower dams planned, under license or under construction with private investment/single government partnership (MRC report 2009a), in contrast to the only 28 which have been notified under the auspices of the MRC (MRC report 2009b).

Conclusions

Our analysis of donors' prominent role in shaping MRC's agenda but yet their limited influence in transboundary water governance of the Mekong leads to two important findings related to IWRM and transboundary management of the Mekong. Firstly, the notion of cross-sectoral coordination embodied in the IWRM concept is entangled with the issue of regulation at national level. In essence, reshaping of the existing bureaucratic power structure would be required if IWRM were to be implemented as conceived. However, such restructuring is probably not often considered, as also evidenced in the case of the Mekong, where IWRM plans are formulated and implemented. Secondly, the current scalar disconnect between national and regional-level decision-making processes sheds light on the overall logic of transboundary water governance in the Mekong. This logic is derived from the way international donors and country representatives sustain MRC organizational activities over time and preserve the existing institutional discrepancies between national and regional decision-making landscape.

This article highlights the political aspects in integrated water resources management and sheds light on existing rules and mechanisms that structurally prevent the establishment of a well-functioning inter-ministerial decision-making platform at the

[29] We acknowledge the importance of ADB GMS program in shaping transboundary water governance in the Mekong. This article, however, does not include ADB GMS initiative into its overall analysis as the current scope and coverage of ADB GMS program requires an analysis of its own.

national level and its consequences for transboundary water governance. It shows the complex relationships between different sectoral ministries, rooted in their autonomy to define their own sectoral development plans. As a result, as such that coordination across ministries is hardly possible. Furthermore, it highlights the logical framework in bureaucratic decision-making processes and how this logic is shaped by existing bureaucratic mechanisms, very much ingrained in the interest to gain and sustain access to development funds as a means to acquire and sustain bureaucratic power (and vice versa), rather than on the need to integrate or coordinate per se.

In a transboundary setting, the preservation of the missing spatial linkages between regional and national-level decision-making processes seems to be related to the interest to sustain the current status-quo at the MRC. This interest refers to countries' strategic positioning towards MRC donors, on the one hand, and donors' strategies to use MRC as what Miller and Hirsch call *'a convenient vehicle for their grants and projects'* (Miller and Hirsch 2003), on the other. By tolerating donors' tendencies to impose their development agenda and being aware of donors' limited influence, countries ensure continuous funds channeling to the MRC without risking donors' interference in national projects and programs. Similarly, donors ensure fund channeling to the MRC and the adoption of its development idea by the MRC without risking either their reputation in the international community or any open conflict with the countries, being aware of MRC disconnect from national decision-making processes. In this way, donors sustained the long-term role of the MRC as part of their envisioned regional decision-making landscape. At the same time, country representatives at the MRC sustain their bureaucratic existence within and outside the organizational context of the MRC. Focusing on their role as fund providers, donors have the tendency to either mix up or camouflage countries' toleration as countries' acceptance and justify their agenda regardless of whether or not it will fit into the existing national decision-making landscape. Similarly, focusing on the interest to sustain their bureaucratic existence, country representatives at the MRC tend to encourage fund channeling from donors to the MRC regardless of whether or not the program that comes with this fund is in line with countries' development perspective.

Theoretically, the MRC cannot have an agenda that is too different from or contradicts the agenda of country members given its formal role as an inter-governmental body. If the MRC or its donors decide to go in a different direction this will result in a tension that will be passed on to the NMCs and make the disconnection between MRC's and country's development planning even more obvious and overtly conflictual. In practice, however, our study and others' suggest that MRC and country members can proceed with their conflicting development plans and perpetuate the current missing spatial linkages between the national and regional-level decision-making landscape, without displaying this tension in public. The MRC focuses its regional research components on research, modeling, and impact assessment, regardless of whether or not the national governments want to incorporate the result of such work into their decision-making framework. Similarly, national governments focus on their development plans regardless of their potential transboundary effect, partially dismissing MRC's role in it. The former is tolerated because it does some window dressing drawing on participatory and IWRM rhetoric. The latter can proceed because the MRC lacks power to direct transboundary water governance issue in the region.

Current transboundary water governance of the Mekong brings into light the MRC's isolated if not virtual existence. Furthermore, the fact that projects in terms of planning, financing and construction have now largely moved out of the conventional donor mechanisms (mainly due to the growing importance of the private sectors) suggests a rather dim future for the MRC if it insists in remaining in the same organizational development path as it is now. As mentioned earlier, with the emerging importance of the private sector, countries no longer depend on international donors in order to proceed with their development plans. Consequently, MRC donors' power to negotiate their development agenda in relation to their power to provide funds is diminished.

This does not mean, however, that MRC does not have any potential role in transboundary water governance. For example, the issue of water diversion to the Isaan region in the Northeast Thailand (Molle and Floch 2008) and the proposed 11 mainstream dams on the Mekong evidenced that there are still issues which sector ministries cannot do away with the MRC. Hence, current discussions about MRC's role and functioning pointing towards riparianization of its Secretariat should be perceived as an opportunity for the riparian nations to question, define and redefine MRC's current role, in accordance with their interests and needs (however complex and fragmented these might be). Yet, we are aware of the difficulties to transform MRC's organizational role and function, bearing in mind MRC's current isolation from the wider decision-making networks at the national level, and their likely preference for the status quo.

Last but not least, with reference to the principles of aid effectiveness as stated in the Paris Declaration (March 2005), experience from the Mekong shows us that the fact that donors' development perceptions have changed over time does not necessarily mean that they can enforce either the direction of transboundary water governance or the development path of river basin institutions. Hence, donors' access to development funds should not be used as a means to impose donors' development agenda. Rather, donor funding efforts should be linked to the overall attempt to fine-tune donors' development ideas with national development strategies, its institutions, and existing (bureaucratic) procedures.

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Tonle Sap Lake and its management: The diversity of perspectives & institutions

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Abstract

This research paper focuses on Cambodia's Tonle Sap area and its institutional setting. The Tonle Sap is, due to its unique flood pulse system and immense aquatic production, most likely the single most vulnerable area to the negative impacts of major water development plans in the Mekong Basin. Due to its remarkable fish production and role as a leveller of the Mekong floods, the importance of the Tonle Sap extends far beyond its own basin as well as the borders of Cambodia. This, in turn, makes the management of Tonle Sap very much a regional issue as well. At the same time the Tonle Sap basin itself is seeing increasing plans for development, particularly in terms of irrigation and agricultural development. These changes are, together with the existing challenges with fisheries management, likely to have an impact to the lake's aquatic production as well. Tonle Sap and its management make therefore a particularly important case study both locally and regionally.

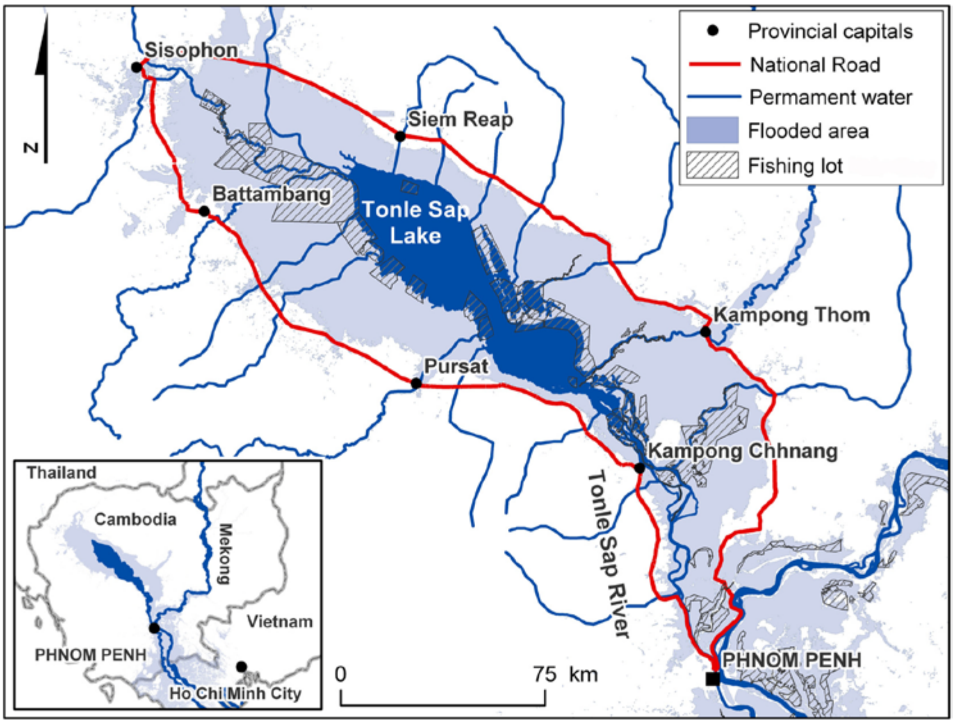
This paper analyses the current institutional setting of water-related management and development of the Tonle Sap area, and seeks to recognise possibilities for

improvements through utilisation of different water allocation tools[1]. The paper first discusses the overall context as well as current management challenges in the Tonle Sap area, including the differing perspectives that the actors at the different levels have on Tonle Sap. Following that, the paper looks at how the current institutional setting for the area's management has been developed during past 10 years or so. In particular, the study seeks to look at the actual driving forces for the differing plans for the management of the area, and to discuss why certain management initiatives have ultimately been more successful than others.

Specific focus will be on the planning processes that have aimed at establishing a management organisation for the Tonle Sap area. Three most important such processes are the Tonle Sap Biosphere Reserve (TSBR) and its Secretariat, ADB's Tonle Sap Initiative and related plans for the Tonle Sap Basin Management Organisation (TSBMO), and the Tonle Sap Basin Authority (TSBA).

Tonle Sap: The heart of the Mekong

The Tonle Sap Lake, the largest lake in the Mekong and Southeast Asia, lies in the central plains of Cambodia. The lake is connected to the Mekong River by the 120 km long Tonle Sap River. The Tonle Sap ecosystem forms a particularly important economic, social and environmental resource for the entire Mekong Basin and for Cambodia in particular (see e.g. Bonheur 2001; Bonheur & Lane 2002; Evans et al. 2004; Poole 2005; Keskinen 2006; Lamberts 2006; Keskinen et al. 2007; MRCS/WUP-FIN 2007; Sithirith & Grundy-Warr 2007; Tonle Sap Biosphere Reserve Secretariat 2007). Well over one million people live in the lake and its floodplains, while up to half of Cambodia's population is estimated to benefit directly or indirectly from the lake's resources both in terms of livelihoods and food security (Bonheur 2001).



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[1] Water allocation is within the PN67 project defined as "formal and informal decision processes (and non-decisions) that alter the physical distribution of water, and water-related rewards, risks, rights and responsibilities".

Figure 1. Tonle Sap Lake and floodplains together with areas reserved for private fishing lots (Map by Matti Kummu).

The Tonle Sap Lake is known for its extraordinary flood pulse system with a remarkable but nevertheless relatively regular seasonal variation in the lake's water volume and level (MRCS/WUP-FIN 2003, Lamberts 2006). During the rainy season part of the Mekong's floodwaters flow to the lake, and the water depth in the lake rises from mere 1 meter even up to 10 meters. As a result, the lake's surface area quadruples and extends the lake over vast floodplains consisting mainly of flooded forests, shrubs and rice fields (MRCS/WUP-FIN 2003). An exceptional and highly productive floodplain ecosystem has been formed, and the Tonle Sap is believed to be among the world's most productive freshwater ecosystems (Rainboth 1996; Öjendal 2000; Lamberts 2001, 2006). However, there is currently very little information available on the actual ecosystem productivity of the Tonle Sap, and the available data is particularly ambiguous on fisheries and fish catches (Lamberts 2006). Due to these and other information gaps (for example on ethnicity and seasonal migration of people), reliable monitoring and analysis of on-going social and environmental changes and their impacts in the area is challenging. The situation has, however, been improving, as the Tonle Sap and its unique flood pulse system is getting more attention nationally, regionally and internationally.

The socio-economic setting of the Tonle Sap area[2] is as diverse and unique as its flood pulsing system. While people living in the lake and its floodplains have adapted to the huge seasonal variation of lake's water level, they are also deeply dependent on the resources that lake and its floodplains provide, including fish as well as other aquatic animals and plants. The fisheries management of the Tonle Sap is, however, dominated by weak implementation of policies as well as unjust practices. When the strong seasonal variation of livelihood sources is combined with unequal access to natural resources and fishing areas and remarkable governance challenges, it is a little wonder that despite the relative richness of area's natural resources, the Tonle Sap remains as one of Cambodia's poorest areas (Keskinen et al. 2007; Starr 2008).

Due to its unusual flood pulse system, immense aquatic production and people's strong dependence on water-related natural resources, the Tonle Sap is among the most vulnerable areas to major changes in water quantity and quality of the Mekong River (see e.g. Kummu and Sarkkula 2008; Lamberts 2008; Keskinen et al. In press;). The current plans for water development in the basin –particularly in form of large-scale hydropower dams– are estimated to cause remarkable hydrological and ecological changes to the lake system. These changes will most probably impact negatively the immense fish production of the lake and have wide-reaching social and economic consequences, threatening particularly the livelihoods of the poorest groups (see e.g. MRCS/WUP-FIN 2007; Kummu & Sarkkula 2008, Keskinen et al. In press). In addition to potential upstream impacts, the Tonle Sap floodplains are also under pressure from more local developments, including plans for large-scale irrigation structures in the floodplain and the tributaries (see e.g. Evans et al. 2005; Keskinen et al. 2007).

Differing perspectives for the Tonle Sap's management

Although being among the most vulnerable areas to changes in the Mekong's water flow, the Tonle Sap has only recently got a proper attention in the

[2] Tonle Sap area is in this study defined to consist of the entire lake basin, with specific focus on the lake proper and its floodplains located between National Roads 5 and 6. The latter area includes parts of six Cambodian provinces, namely Kampong Chhnang, Kampong Thom, Pursat, Siem Reap, Battambang and Banteay Meanchey.

considerations about water development in the Mekong River Basin. Part of the explanation for this is that the existing management systems in the area are complex and partly overlapping (Mareth et al. 2001; Sokhem & Sunada 2006; Tonle Sap Biosphere Reserve Secretariat 2007). In addition, the number of actors working on the Tonle Sap is remarkable, with different actors having very differing views and interests on the area and its resources. As noted by one researcher well familiar with Tonle Sap: “Tonle Sap has become the most contested basin both in Cambodia and Mekong Region” and “At all levels the horizontal relationships [between different actors] and feedback mechanisms are weak”[3]. It is therefore no wonder that the Tonle Sap has been lacking a clear representative –and, hence, voice– in both national and regional discussions[4].

The institutional arrangements for the Tonle Sap’s management are also closely related to the perspectives –local, national, regional and global– that the area is looked at. While none of these perspectives is consistent but include different, often conflicting dimensions, each one of them also has a certain dimension that can be seen to be stronger than others. These are next discussed in more detail for the three perspectives that have so far been the most influential in shaping the management regimes in the area: National, Regional and International perspectives[5].

National perspective: Development and revenue generation

For the Royal Government of Cambodia and its provincial line agencies, the Tonle Sap and its resources have for long been an important source of national revenue. As a result, the development of the area has been seen to focus first and foremost on resource exploitation (Tonle Sap Biosphere Reserve Secretariat 2007). The fisheries of Tonle Sap generate remarkable income for the provincial and national budgets. Also other uses and resources –particularly agricultural development– are considered increasingly important.

The Tonle Sap’s fish production has been significant already for centuries, creating foundation for local livelihoods and food security. It has been estimated that up to 82% of all animal protein consumption in Cambodia comes from fish and other aquatic animals: a proportion that is considerably higher than in other Lower Mekong countries or even in the most countries of the world (Hortle 2007). Due to large variety of fishing in Cambodia and the lack of systematic data gathering, it is difficult to establish reliable estimates on the actual fish production or even fish catches. Currently the estimates for the Tonle Sap’s annual fish catch are somewhere between 175’00 – 250’000 tons (Lieng and Van Zalinge 2001; Van Zalinge et al. 2000; Baran 2005).

In addition to crucial nutritional value, fish is socially and economically very important to Cambodia. Establishing the total economic value of fish catches is difficult, and the exclusion of the subsistence fish catch from the monetary estimates is likely to lead underestimations (Van Zalinge et al. 2000). Nevertheless, the value of Cambodia’s annual inland fish production (290’000-430’000 tons) at a landing site has been estimated to be between US$150 and US$200 million (Van Zalinge et al. 2000; FACT & EJF 2001). This value is

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[3] Personal email correspondence (March 2010): a Cambodian researcher having a long-term experience from the Tonle Sap

[4] This has also led to confusion and even misunderstandings about the characteristics of the lake and its resources. For example, the understanding of the lake’s unique flood pulse system and the drivers for its aquatic production is –despite their importance for millions of people– still vague.

[5] There naturally do exist also different forms of local management bodies related e.g. to use and management of water, fishing areas, and forests (see e.g. Evans et al. 2004; Middleton & Tola 2008).

estimated to increase in the processing and marketing chain to somewhere between US$250 to US$600 million (Van Zalienge et al. 2000; EIC 2007). In comparison, the total monetary gross value of paddy rice in Cambodia has been estimated to be between US$500-600 million (EIC 2007).

Due to the remarkable economic importance of fish, the management of the Tonle Sap has at the national level traditionally been considered first and foremost as the management of fisheries. Consequently, for central and provincial governments, the Tonle Sap appears chiefly a space for exploitation and revenue generation – particularly through fisheries, but increasingly also through other resources such as agricultural land, forests and even oil[6] (Evans et al. 2004; People's Daily Online 2007; Tonle Sap Biosphere Reserve Secretariat 2007).

The institutional arrangements related to the Tonle Sap's management have therefore been framed so that the Fisheries Administration under the Ministry of Agriculture, Forestry and Fisheries (MAFF) has been the key governmental institution in the Tonle Sap. The Fisheries Administration has a remarkable control over the entire lake-floodplain area, and in the fishing lots[7] in particular. At the same time there are naturally several other governmental institutes involved in the area, including the Ministry of Agriculture, Forestry and Fisheries (focusing on agriculture, forests), the Ministry of Water Resources and Meteorology (focusing on water-related development, including large-scale irrigation structures and dams), and the Ministry of Environment and the related Tonle Sap Biosphere Reserve Secretariat (focusing on biodiversity conservation).

Regional perspective: Sustainable development

The regional perspective for the Tonle Sap is influenced largely by the Mekong Agreement that was signed in 1995 by four Lower Mekong countries of Cambodia, Laos, Thailand and Vietnam (MRC 1995). The Agreement created the Mekong River Commission (MRC) that forms a space of engagement where the four member countries can coordinate their plans and uses of the river. The Agreement can thus see to provide a certain level of security for the downstream countries from uncontrolled and non-agreed development in the upper parts of the basin (excluding China that is not a MRC member).

The Mekong Agreement has different meanings and implications for the member countries. In principle, the Agreement provides a guarantee for Vietnam that the delta will not be drained of fresh water during the dry season, while for Laos and Thailand it creates a forum to discuss and gain acceptance its own development plans related for instance to irrigation and hydropower development (Öjendal et al. 2002; Sithirith 2007). For Cambodia, the agreement basically secures sufficient amount of water and also ensures the sustainability of the Tonle Sap system. Indeed, the Agreement makes a special reference to the Tonle Sap and its exceptional flood pulse system, with Article 6 stating that the parties agree to cooperate "to enable the acceptable natural reverse flow of the Tonle Sap to take

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[6] Cambodian Prime Minister Hun Sen seems to consider both conservation and exploitation of the Tonle Sap important: while he has been concerned that the lake's conservational status might constrain fishing and extraction of oil and mineral resources (People's Daily Online 2007), he has also emphasised the need for integrated basin-wide approach that aims to preserve the lake's ecosystem from the negative impacts caused by local and regional development (MRC 2007).

[7] The fishing lots are geographical concessions auctioned to the highest bidder for a certain period, usually two years. The lots include lake areas, rivers, ponds and inundated forest and are typically located in the most productive fishing areas. The owner of the fishing lot has an exclusive right to harvest fish from the lot, to sub-lease parts of the lots, and to keep everyone else out from the lot area.

place during the wet season" (MRC 1995: 8). The importance of the Tonle Sap and its unique flood pulse system has been noted also by other regional actors, including the Asian Development Bank and the Greater Mekong Subregion Program[8] (ADB 2005a, 2006a, GMS Environment Operations Center n.d.).

The Tonle Sap and its unique lake-floodplain ecosystem seem thus to be viewed regionally as an environmentally, socially, economically and culturally important area. Consequently, among the main aims of the MRC and other regional organisations such as the Asian Development Bank (ADB) is to promote sustainable development of the Tonle Sap area as well as to protect the lake-floodplains system from the potential negative impacts caused by water development in the upper Mekong Basin. In practice, however, it remains unclear how the objectives stated in the Mekong Agreement will in reality be met and for instance what the "acceptable natural reverse flow of the Tonle Sap" mentioned in the agreement actually means. Such questions are particularly critical given the current hydropower boom in the region.

When looking at the connection between the MRC and the Tonle Sap, it can be note that the Mekong Agreement places the Cambodia National Mekong Committee (CNMC) as the main institution in Cambodia to address the issues related to the Mekong River, including the Tonle Sap system. The CNMC is essentially a coordinating body between different ministries, aiming to coordinate the actions that the ministries and other actors have in relation to the management of the Mekong River, including the Tonle Sap[9] (Royal Government of Cambodia 1999, CNMC n.d.). However, as the CNMC has to carry out its tasks with different and often conflicting priorities, values and perceptions posed by its highly sectoral member ministries, the CNMC has often complained about being by-passed or ignored (Sokhem & Sunada 2006).

International perspective: Conservation

The global perspective for the Tonle Sap resembles the regional one, emphasising the uniqueness of the Tonle Sap ecosystem and the need for its protection. There is currently also a substantial international research interest on the Tonle Sap due to its extraordinary flood pulse-dependent ecosystem and high aquatic production. Consequently, the Tonle Sap is at the global scale commonly considered as an iconic, unique area well worth conserving.

Among the most important international organisations in the Tonle Sap is UNESCO that has recognised the Tonle Sap as a biodiversity hotspot area. The UNESCO designated the Tonle Sap Lake and its floodplain as a Biosphere Reserve in 1997, and persuaded the Government of Cambodia to increase its efforts in conserving the Tonle Sap's exceptional biodiversity. Such a view is further strengthened by several international researchers and NGOs working in the area. This kind of international interest towards the Tonle Sap and its protection has

[8] At the same time it is interesting to note that the GMS Program (that is also a strong promoter of energy development, including hydropower) is not really focusing on the Tonle Sap –or indeed on any major water ecosystem in the region– in its environmental and conservation initiatives, despite the obvious threats that hydropower development causes to such ecosystems. The GMS Program's Biodiversity Conservation Corridors Initiative, for example, has its only pilot site in Cambodia in Cardamom Mountains (ADB 2008). Indeed, it can be argued that the entire Mekong River and its ecosystems are almost completely lacking from the current focus of the GMS Program – even when the river is included in the very name of the program.

[9] As stated in Royal Government of Cambodia (1999: 2): "The CNMC shall have the mandates and responsibilities as follows: ... To cooperate, advice and monitor other units of the Ministries concerned, provinces and towns, for the implementation of all relevant decisions of the Royal Government relating to the Mekong River""

also implications at the national level. The main institution responsible for biodiversity conservation in Cambodia is the Ministry of Environment that was set up in 1993. Due to its remarkable significance in terms of biodiversity conservation, the Tonle Sap area has become a major focus area for the Ministry. As a result, the conservation space of the Tonle Sap has become a kind of space of dependence for the Ministry, ensuring and institutionalising its presence in the area.

The conservational focus on Tonle Sap was strengthened remarkably in 2001, when the Tonle Sap Biosphere Reserve (TSBR) and its Secretariat were formed by Royal Decree (Royal Government of Cambodia 2001). The decree gives the TSBR Secretariat the mandate to coordinate the protection and sustainable management of the Tonle Sap. While the TSBR Secretariat was established officially under the CNMC, in practice it has been closely affiliated with the Ministry of Environment, creating certain confusion about its actual role and mandate[10].

Different perspectives, differing management interests

As demonstrated above, the Tonle Sap and its resources are looked rather differently at national, regional and international levels. These differing views also influence the ways that the different projects management institutions of the lake have been developed – and funded. The main challenge is that while both international and regional perspectives tend to emphasise the conservation of the Tonle Sap's unique ecosystem, the national perspective is –quite naturally– focusing more on the commercial exploitation of its fisheries and other resources. The so-called conservation space is thus overlaid with the commercial space particularly in the fishing areas, but also for instance in agricultural areas. This creates competition and tensions between the two spaces, especially in areas where fishing and agricultural activities overlap with conservational areas.

The overlaps between the Biosphere Reserve areas and commercial fishing lots produce also conflicts of interests among state agencies in both the floodplain and the lake proper (Bonheur and Lane 2002). Although the Tonle Sap Biosphere Reserve is basically applicable throughout the lake-floodplain area, in practice the Ministry of Environment has full authority only over the so-called conservational Core Areas[11]. The Core Areas are also partly overlapping with fishing lots that are under control of Fisheries Administration. Thus, the two most dominant spaces in the Tonle Sap –fisheries space and conservation space– are both spatially and institutionally contested[12]. This controversy over control of certain areas and spaces explains partly the current confusion and overlaps related to the management context of the Tonle Sap.

Current management challenges in Tonle Sap

The opportunities and threats that both local and regional development pose for Tonle Sap and its unique flood pulse system argue for a management system that would coordinate the development within the basin. Such coordination should ideally be based on a comprehensive assessment of the potential impacts that

[10] The Royal Decree establishing the TSBR gives the management of the TSBR Core Areas to the Ministry of Environment, while the buffer zone and a flexible transition zone is to be managed by line ministries, through the coordination of CNMC (Royal Government of Cambodia 2001).

[11] The Royal Decree divided the TSBR into three zones, namely the Core Areas, a Buffer Zone and a flexible Transition Zone (Royal Government of Cambodia 2001)

[12] The two spaces also have similar objectives for example in terms of protection of flooded forest areas.

local and regional development plans are likely to have to the lake, its resources and people. Such an “integrated basin-wide approach” for the management and development of the Tonle Sap has recently been requested even by the Cambodian Prime Minister Hun Sen (MRC 2007: 28). Such an approach is not, however, the reality, but the Tonle Sap’s current management context is both confusing and complex, with multiple actors working with partly overlapping and competing agendas.

Great part of the complexity of Tonle Sap’s management is related to Cambodia’s broader challenges with governance. As noted by World Bank (2006: 131) Cambodia’s development challenges are “fundamentally about ‘governance’, that is, how the rules, institutions, and systems of the state operate and how the state relates to citizens, civil society and the private sector in terms of transparency and accountability”. Cambodia’s governance system suffers from both horizontal and vertical discontinuities, and water-related issues are handled under several ministries with their specific mandates, ambitions and policies. Also the functioning of vertical links between the central government, provincial and local authorities and villages is troublesome. An additional challenge is the aid dependency of Cambodia’s governance system, and the dominance of donors, development banks and international NGOs in shaping the government policies and introducing new approaches. Such dominance has also been well visible in the Tonle Sap area, including its different management initiatives.

The management of the Tonle Sap is also characterised by multiple dimensions in several different aspects, raising questions whether such a system can in any reasonable way be managed comprehensively, at least by a single institution. Sokhem & Sunada (2006), for instance, have recognised the following institutional issues as impediments for the reform policies and effective basin governance in the Tonle Sap: weak governance and wide-spread corruption, absence of key law and its clarity, lack of law enforcement and weak judicial system, slow decentralization and de-concentration, and lack of clear property right in forestry, fisheries and land (Table 1).

Table 1. Institutional impediments for effective basin governance in the Mekong and the Tonle Sap (Sokhem & Sunada 2006).

Issue	Assessment	Management intervention
Weak governance and wide-spread corruption => Failure to ensure compliance and monitoring	• Strong resistance by powerful and elite to the reform. • Poor system of accountability. • Pocketing official revenues, patronage/funding political campaigns.	• New governance principles such as transparency & accountability, public participation & gender, equity and equal access, check and balance.
Absence of key law and its clarity	• Society is almost exclusively regulated by government and sectoral regulations. • Legislative process was tied to other high political agenda, such as WTO accession, and Khmer Rouge trial, and political deadlock.	• Move to a broader cross-sectoral legislation and improve public participation in its formulation. Sound policy and legal foundation for natural resource management.
Lack of law enforcement and judicial system is weak	• Either because government agencies lack of technical and managerial capacity or because of corruption, nepotism and intimidation. • Political interference and corruption in judicial system	• Long over due drastic judicial reform must be pushed hard. • More positive compliance approach.
Decentralization and de-concentration painfully slow	• Government and its agencies not fully realigned their systems or capacities to support that. • No clear definition of functional, administrative and budgetary responsibility and poor financial base. • Complex financial implication and interest.	• Clear definition of role and responsibility & maximization of people participation. • Budget sustainability.
Lack of clear property right in forestry, fisheries and land	• Poor demarcation of fishing lots, open access areas, and protected areas, fishing rights, land tenure and landless issues. • Many case of land grabbing	

The complexity of the Tonle Sap’s institutional setting has also been noted by Mok Mareth (Minister of Environment) and colleagues, who in 2001 stated that: “the multi-stakeholders nature and geographical magnitude of the Tonle Sap ecosystem is the primary reason of the current complex and often confused institutional arrangement for the Tonle Sap Lake" (Mareth et al. 2001: 11). They concluded that "poor coordination has already resulted in data deficiency, lack of coherent policy, institutional conflicts, wasted money and unclear mandate", and that the reasons for inefficient institutional arrangement include "the deficiency of human resources and capacity, lack of transparency, poor coordination, slow decentralization, shortage of financial resources, ineffective management of public expenditure and foreign aids" (Mareth et al. 2001: 12). As a possible solution to ease this complexity, they highlight the importance of government's commitment to impose appropriate legal and institutional framework to ensure the successful management of the Tonle Sap.

In the context of Tonle Sap, fisheries management forms a particularly challenging governance issue. Cambodia's fisheries management is dominated by weak implementation of policies, corrupt and unjust practices as well as exclusions from access of the local communities (see e.g. Bonheur & Lane 2002; Ratner 2006; Salayo et al. 2006; Tonle Sap Biosphere Reserve Secretariat 2007). The epitome of this is the operation of large-scale, commercial fisheries that is based on so-called fishing lot system that exclude most people from the most productive fishing areas during the most productive fishing season. This exceptional fishing lot system has created tensions between the local villagers and the fishing lot owners throughout Cambodia. The tensions were soaring at the turn of the millennium, when the villagers around the Tonle Sap started to protest more loudly against the excluding fishing lot system, the extended boundaries of lot areas, and government's inability to respond to the conflict (see e.g. Degen et al. 2000; NGO Forum 2000; Bonheur 2002; Sina 2003; Keskinen et al. 2007).

Responding to the accumulation of the fisheries conflict, the government proclaimed in 2001 radical and sudden change in country's fisheries management. Half of the total area of the private fishing lots was changed to public fishing lots open for community fisheries[13]. Although this shift aimed to improve peoples' food security and to ease the tensions between local people and fishing lot owners, the reform has also had its setbacks – many even think that the tensions just took different forms (Bonheur 2002; McKenney & Tola 2002; Ratner 2006; Keskinen et al. 2007). The main challenge with the community fisheries is that –although designed to support particularly the poor– they are in some cases actually excluding the very subsistence fishers, and instead providing a negotiation ground for medium and larger scale fishers as well as means to control the activities of the poorer fishers (Keskinen et al. 2007).

In addition to fisheries, management of several other vital resources –most importantly forests and land– are having similar challenges with access and control (Evans et al. 2004; Le Billon 2007). In Tonle Sap, one of the most recent trends has been the emergence of large irrigation areas in different parts of the floodplains (Evans et al. 2005). Traditionally large parts of the floodplains have not been under clear ownership, but have been used more occasionally for different purposes. However, the drive for increased agricultural production together with improved accessibility of the Tonle Sap Area has led both private investors and other actors such as the Asian Development Bank (ADB) to increase their investment in the agricultural development of the Tonle Sap's floodplains.

The investments in agricultural development are materialising as a rapid expansion of irrigated agriculture and related structures that are in many cases undermining local customary rights for the floodplain areas and having a

[13] In the Tonle Sap Area, 53.4% of the lot areas prior to 2001 are still under private fishing lot system. In Battambang and Kampong Chhnang provinces –where many of the most productive fishing areas are located– this figure is over 70% (McKenney & Tola 2002).

potentially negative impact for fish production. There have also emerged clear institutional rivalries between different ministries and provincial line agencies about the process of agricultural development in the floodplains. In Kampong Thom province, for example, the provincial departments of agriculture and fishery are concerned about the problems related to private irrigation structures, and are demanding the removal of some of the new structures (Keskinen et al. 2007)[14].

Initiatives for organising Tonle Sap's management

Need for improved and better coordinated management of the Tonle Sap area has been recognised already for years (see e.g. ADB 2002, Mareth et al. 2001, Sokhem & Sunada 2006, MRC 2007, Niras 2008). Consequently, the Tonle Sap has seen several, partly overlapping initiatives to enhance the situation through establishment of a coordinating body or mechanism for the Tonle Sap. This chapter analyses three initiatives that we argue have been the most important ones. Such initiatives are the Tonle Sap Biosphere Reserve (TSBR) and its secretariat, the ADB-driven Tonle Sap Basin Management Organisation (TSBMO), and the Tonle Sap Basin Authority (TSBA, nowadays called Tonle Sap Authority TSA).

Two of these institutes –the TSBR Secretariat and the TSBA– exist, while the plans for the TSBMO were in essence halted in 2007 with the establishment of the TSBA (Figure 2). Despite the obvious differences in the planned mandate and scope of these institutes, common to all of them is the recognition that improved management requires better coordination between the various agencies working at different levels and sectors in the Tonle Sap.

Figure 2. Timeline of selected key events in the Tonle Sap, including the establishments of TSBR Secretariat and TSBA plus the approximate planning period of TSBMO.

Tonle Sap Biosphere Reserve and its Secretariat

The Tonle Sap Biosphere Reserve (TSBR) was established by Royal Decree in 2001, and it is considered as the first major step forward in the establishment of environmental governance structure in the Tonle Sap (Sokhem & Sunada 2006). The impetus for the establishment of TSBR was closely linked to conservation of the Tonle Sap system, and therefore to the international perspective emphasising

[14] The agricultural development in the Tonle Sap floodplain has been slowed down since 2007, after the Prime Minister Hun Sen noted in a speech that the lake is facing a serious threat of overexploitation, particularly in form of clearing of flooded forest for large-scale rice farming (MRC 2007).

the importance of Tonle Sap's biodiversity[15]. The Royal Decree gives to the TSBR three complementary functions on conservation, development and logistics (Royal Government of Cambodia 2001):

"a conservation function to contribute to the conservation of biological diversity, landscapes, and ecosystem, including genetic resources, plant, fishery and animal species, and to the restoration of the essential character of the environment and habitat of biodiversity;

a development function to foster sustainable development of ecology, environment, economy, society, and culture;

a logistic function to provide support for demonstration projects, environmental education and training, research and monitoring of environment related to the local, national and global issues of conservation and sustainable development"

Institutional setting

The Royal Decree established the TSBR Secretariat under the Cambodia National Mekong Committee in order to "coordinate and strengthen cooperation between ministries, agencies, local authorities and communities concerned for the protection and sustainable management of the Tonle Sap Biosphere Reserve" (Royal Government of Cambodia 2001: 4). This has two interesting implications: Firstly, the TSBR Secretariat's main role is defined to be to coordinate the cooperation between different actors working with the Tonle Sap, including sustainable development of the area. Secondly, the fact that the TSBR Secretariat operates under the CNMC forms a natural connection to the regional Mekong River Commission, and links the conservation and development of the Tonle Sap to water resources management in the entire Mekong River Basin.

The TSBR Secretariat's role and resources was further strengthened in 2002, when the ADB-, GEF- and UNDP-funded Tonle Sap Environmental Management Project (TSEMP) was started. The project was coordinated by the TSBR Secretariat, and it aimed to establish a coordination framework and information dissemination mechanisms for the Tonle Sap. The project had following objectives: "The Project will strengthen the TSBR Secretariat. It will create the capacity to address legal and coordination issues in the TSBR, rationalize the designation of the various protected areas in the TSBR, and formulate common policy objectives for managing the TSBR" (ADB 2002).

The TSEMP also increased the ADB's involvement in the Tonle Sap, leading eventually to the formulation of the ADB's Tonle Sap Basin Strategy in 2003 and the plans for the Tonle Sap Basin Management Organisation (Chanrithy 2005). Overall, the ADB's increased interest in the Tonle Sap has been significant also for the TSBR Secretariat, who has been involved in several ADB projects focusing not only on biodiversity conservation, but more broadly on the development of the Tonle Sap basin. Through the ADB-funded projects, the TSBR Secretariat have got increased amount of resources for its work, and was for example able to start publishing TSBR Bulletins as well as to establish a web-based Environmental Information Database for the Tonle Sap (http://www.tsbr-ed.org).

In January 2007, the TSBR Secretariat published a policy paper describing the management challenges in the Tonle Sap area and providing its view on how to improve the situation. The paper emphasises the need for coordinated management and suggests a common framework for policy coordination. The framework would place the TSBR Secretariat into the center of the Tonle Sap's

[15] As stated in the Royal Decree: "Recognizing the unique ecological, environmental, economical, social, and cultural significance of Tonle Sap Lake, a Tonle Sap Biosphere Reserve is hereby established in accordance with the statutory framework of the World Network of Biosphere Reserve" (Royal Government of Cambodia 2001: 2)

management, with the coordination mechanism consisting of the TSBR Committee as well as Technical Advisory Groups and Provincial Working Groups and Advocacy Forums (Whitington & Norin 2006; Tonle Sap Biosphere Reserve Secretariat 2007). Such a management mechanism was, however, never formed. The main reason for this is most likely the establishment of the TSBA during the same year that put the entire TRBR Secretariat into a new position.

Tonle Sap Basin Management Organisation

The Tonle Sap Basin Management Organisation (TSBMO, also called the Tonle Sap Basin Organisation TSBO), was essentially the brainchild of the Asian Development Bank (ADB). In essence, the TSBMO was supposed to form a coordination body for the ADB's Tonle Sap Initiative and the different projects under it, replacing the more diverse arrangement where different ministries and agencies are responsible for implementing different Tonle Sap-related projects. In this way, the ADB's plans in the Tonle Sap can also be seen to represent a continuation of the ADB's broader objective to establish River Basin Organisations (RBOs) throughout Asia (ADB 2001; Molle & Hoanh 2008)[16].

The plans for establishing the TSBMO are closely linked to the ADB's Tonle Sap Initiative and related Tonle Sap Basin Strategy[17]. Tonle Sap Initiative was formed in October 2002 to establish "a partnership of organizations and people working to meet the poverty and environment challenges of the Tonle Sap" (ADB 2008). In July 2003, the ADB formulated the Tonle Sap Basin Strategy to support the ADB's Country Strategy and Program. The strategy forms the basis for setting priorities and planning assistance in the basin, and is based on three underpinning principles: sustainable livelihoods, social justice, and a basin-wide approach. The strategy also describes the development objectives for the ADB in the Tonle Sap basin, namely to foster, promote, and facilitate pro-poor, sustainable economic growth, access to assets, and the management of natural resources and the environment (ADB 2005a).

The ADB has implemented two technical assistance (TA) projects for Cambodian Government to establish Tonle Sap Basin Management Organization "to improve institutional and organizational arrangements for managing land, water and biotic resources in the Tonle Sap basin" (ADB 2005b). The final report of the second TA outlines the planned design for a basin organization, concluding that the organisation is proposed "to assist the Royal Cambodian Government to sustainably develop the Tonle Sap Basin's economy and infrastructure, advising on: 1) formulation of water policy and strategy to manage, preserve, investigate, plan, and develop water and related natural resources, and 2) policy and strategy to conserve biological diversity and maintain, use and manage natural resources within the TSBR (ADB 2006b)"

Institutional setting

The ADB proposed a four-level, rather complicated administrative structure for the TSBMO. The structure would consist of the Tonle Sap Basin Coordination Committee (TSBCC) and two Secretariats, Sub-basin Committees, Provincial Water and Related Resource Committees and secretariats, and District Water and Related Resource Taskforces and secretariats (ADB 2006b). The proposed

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[16] In its water policy, the ADB stresses that "To ensure effective IWRM, river basin organizations need to be established with monitoring and regulation from higher levels." (ADB 2001: 18).

[17] When thinking of the ADB's very active involvement in the Tonle Sap during the past years, it is interesting to note that the Tonle Sap Lake became part of the official strategy of the ADB for Cambodia only around 2000, and that the ADB's involvement in the area really started as late as in 2002 along with the Tonle Sap Environmental Management project (Nuera 2005; Chanrithy 2005).

structure places –similarly to TSBR Secretariat– Cambodia National Mekong Committee on top of the organisational structure of the TSBO. The Coordination Committee would then serve as a major institution coordinating the actions of different partner organisations and sub-committees. In addition, large part of the actual responsibility for planning and implementation is at lower governance levels i.e. in the sub-basins, provinces, and districts (Figure 3).

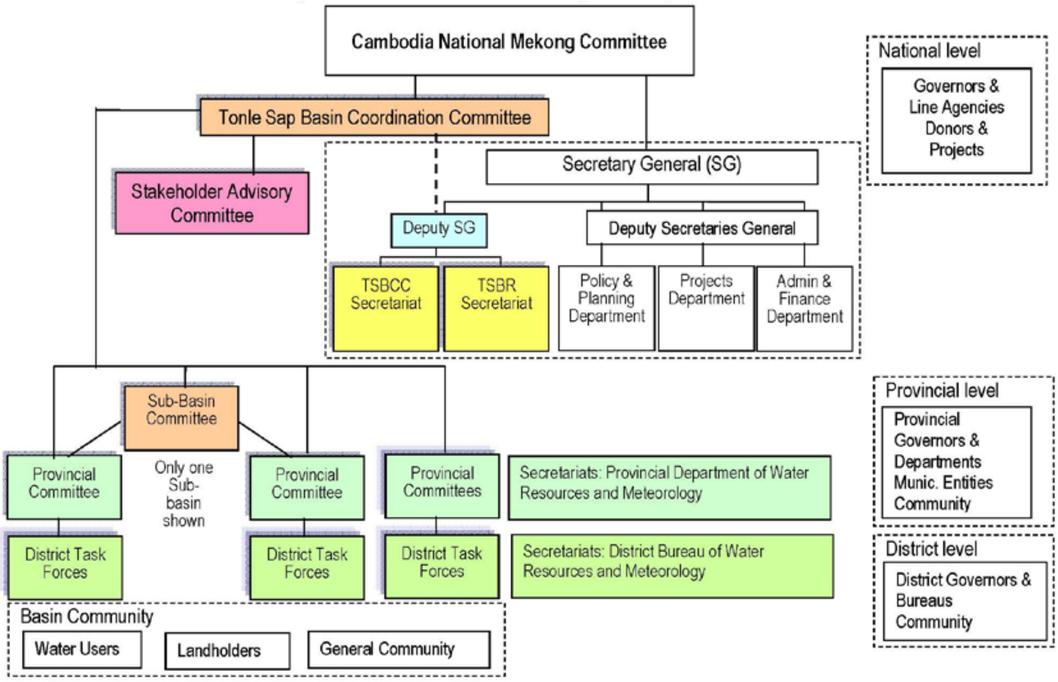

Figure 3. Proposed structure of the ADB-planned Tonle Sap Basin Management Organisation (ADB 2005b).

The latest newsletter of the ADB's Tonle Sap Initiative, published back in May 2006, focuses on the TSBMO and overall on Tonle Sap's management, concluding that "After discussion of practicable options and the arguments for and against them, determinations were reached that the main vehicle for basin-wide management of the Tonle Sap should not be a new special purpose organization. Neither should it be the assignment of new authority to an existing institution. Instead it would be a committee, established through new legislation requiring that it exercise broad vision and accept formal obligations and mandates" (ADB 2006b: 7). The newsletter goes on to highlight the importance of establishing the ADB-proposed management structure, declaring in a rather pompous manner that: "When it [the legislation to establish TSBCC] is finalized, adopted, and publicly announced, the [Cambodian] Government will have reached a turning point. From a start 5 years ago with a felt sense of incomplete response to evident threats to the Tonle Sap, the Government will have moved to professional identifications of needs in various areas, to an elaborated strategy for response, to an orderly plan of organization for addressing problems, and to having formal authorization in hand to act" (ADB 2006b: 14).

The ADB's plans for the establishment of the TSBMO were therefore well developed, and in 2006 the Technical Assistance Report of ADB's Water Resources Management (Sector) Project included the establishment of the TSBMO as one of its three parts. This part was planned to run from November 2006 to April 2008, and it aimed at the establishment of the TSBCC within the Cambodia National Mekong Committee. The report describes the tasks of the TCBCC as to: 1) provide coordinated water sector and related resources planning; 2) facilitate stakeholder and community participation; and 3) provide information on water sector and related resources (ADB 2006c).

Overall, the ADB's plans for a management institute for the Tonle Sap can thus be seen to have a focus on setting up a coordinating management organization, rather than a more powerful basin authority that would absorb the functions of different ministries and agencies (ADB 2006b; Sokhem & Sunada 2006). The TSBMO was envisaged to deal mostly with policy and planning –including the planning of ADB's grants and loans for the area– as well as to serve as a discussion forum for ministries and local government agencies. According to ADB's plans, most operating functions and day-to-day management issues would have thus remained with individual ministries and agencies concerned (Sokhem & Sunada 2006).

Running into troubles...

The ADB's plans for Tonle Sap's management were strongly influenced by the ADB's policy on establishment of river basin organizations, building on well-established 'truths', or best practices, on how these kinds of water resources management institutions should ideally be designed[18]. Consequently, in addition to building on existing institutional setting and on coordination between different actors, the ADB emphasised basin-wide view, community involvement, transparency and equitability in its approach. These all are ingredients that are considered important for successful water resources management (see e.g. GWP 2000; Molle & Hoanh 2008; World Water Assessment Programme 2009).

In one of its publications, the ADB describes its planning process in a following way (ADB 2006: 4): "the Tonle Sap Basin Strategy identified early the imperative to develop better institutional arrangements for basin management. It specified that natural resource management plans developed in partnership by communities and the Government would outline a transparent and equitable process of resource management over the next 10 years. The plans would incorporate community aspirations regarding natural resources and contain the necessary rules relating to their management. ... There would be regular reporting between the Government and communities on the extent to which the plans are being effective in achieving their objectives. In this way, there would be more accountability to communities to ensure that all efforts and investments are best placed to deliver on results."

While the above-mentioned principles of transparency, equitability and participation sound very good and agreeable, it can be asked whether they in reality can be achieved in a setting that is both complex and contested – and highly political[19]. Such a question becomes particularly important when considering the criticism towards the ADB and its plans in the Tonle Sap. Several authors have argued that the ADB's theories and actual practises of the planning process are far apart, and as a result the process has actually been very much an ADB-driven top-down process, rather than a truly participatory and decentralised one (see e.g. FACT 2005a, FACT 2005b, Middleton & Tola 2008, Rosien 2006, Middleton n.d.)[20]. The ADB has also more generally been criticised for interfering

[18] Such a view is well visible in the presentation of a CNMC representative on TSBMO that states that "To ensure the sustainable development in the Tonle Sap Basin as well as to catch-up with the new world' style of Basin Development and Management, there is a need to set up a proper Tonle Sap Basin Organization with adoption of IWRM to be used in the management instead of sectoral approach" (CNMC No Date).

[19] See also Molle (2008) and his discussion about nirvana concepts used in the water sector.

[20] Rosien (2006) also raises concerns about the overlaps between different organisations, most importantly between the proposed TSBMO and the existing TSBR Secretariat, concluding that "The overlaps and cross-cutting lines between the different bodies raise the question whether such complexity is likely to facilitate the goal of sustainable natural resource management or hinder it. The risk of organisational congestion increases in light

with the countries internal policies and imposing idealistic policies that are not properly connected to the existing institutional frameworks and policies (Nuera 2005; Oehlers 2006; Molle & Hoanh 2008).

Despite plenty of time and resources put into the planning of the TSBMO, the ADB's plan for the establishment of the Tonle Sap Basin Management Organization has since 2007 been in essence completely halted. The main reason for the halt has not been the criticism by the NGOs and researchers towards the ADB's plans, nor the lack of future plans and funds (as illustrated by several ADB's documents highlighting plans to continue with TSBMO, see e.g. ADB 2006b; 2006c). Instead, the main reason is to be found from yet another process focusing on setting up a management organisation for the Tonle Sap; this time as a basin authority.

Tonle Sap Basin Authority

The Tonle Sap Basin Authority (TSBA) –currently called Tonle Sap Authority (TSA)– was established by a Royal Decree in September 2007 (Royal Government of Cambodia 2007a). The establishment of such an authority took many, even experts working on Tonle Sap, by surprise, as the establishment process didn't include same kind of public engagement procedure as for instance the process for establishing the TSBMO. Instead, the TSBA was planned by a relatively small group of people with close linkages to the Cambodian government. As one international consultant working on the Tonle Sap noted: "The establishment of the TSBA was not a rational, open process, but a quick process that has led to complete confusion [about the Tonle Sap's management]"[21].

The Royal Decree established the TSBA with following description: "An Authority is established for coordination of the management, conservation and development of the Tonle Sap Basin areas". The proposed mandate of the TSBA is therefore almost exactly similar to that of the the TSBR Secretariat, raising questions about overlaps between the two institutions. While the past management activities in the Tonle Sap –such as the TSBR– have focused on the provinces surrounding the lake, the TSBA was planned to take a broader, basin-wide approach. The jurisdiction of the Authority was planned to cover the entire catchment area of 11 different river basins, including areas within 10 provinces and the municipality of Phnom Penh[22] (Starr 2008). All in all, this area makes up around 42 percent of Cambodia's territory and is home to 4.4 million people, about a third of the country's population (Starr 2008).

According to the Royal Decree, the TSBA "Serves directly as headquarter of the Royal Government in TSI projects by conducting research, monitoring, and providing comments to the Royal Government of Cambodia" (Royal Government of Cambodia 2007a). Hence, although the TSBA was established without any involvement by the ADB, the Decree refers directly to the ADB-initiated Tonle Sap Initiative (TSI) and essentially moves the TSI activities –and resources– under the supervision of the TSBA.

Establishing the TSBA

When looking at the structure and mandate of the TSBA, it becomes clear that the Authority was planned to be an almost exact opposite to the proposed

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of the fact that many of the agencies and units tend not to communicate very well with each other".

[21] Personal comment (February 2009): an international consultant working on the Tonle Sap.

[22] Other sources say that the administrative areas of the TSBA would cover 15 provinces (The Cambodia Daily 2009).

TSBMO. The TSBA for example has much simpler –and more centralised– organisational structure (Figure 4). The authority also has considerable powers, including the possibility to sign agreements, protocols and contracts. The sub-decree increases these powers future and gives remarkable power to Secretariat, including task to: “Communicate, cooperate and coordinate with relevant line ministries, institutions, local authorities, international organizations, national organizations, non-governmental organizations, and civil societies on all activities concerning the management, conservation and sustainable development of the Tonle Sap Basin” (Royal Government of Cambodia 2008)[23].

[23] The decision on the (original) composition of the TSBA highlights the political weight of the TSBA as well. According to the Decision (Royal Government of Cambodia 2007b), the composition of the TSBA consists of a Chairman (Senior Minister), six Vice Chairmen (including five Ministers) and 29 Members (including 10 Ministers, 4 Secretary Generals and 11 Governors from provinces surrounding Tonle Sap Lake and River). The TSBA Members also include the Secretary General of the CNMC as well as Ministers from all CNMC member ministries except Ministry of Foreign Affairs and International Cooperation.

From TSBA to TSA

Although the Royal Decree established the TSBA already in September 2007, its actual mandate and structure are still (as of March 2010) unclear. Among the main reasons for this lack of clarity are the differing views that different political actors have on the Tonle Sap and on the role that TSBA should have on its management. Particularly the different ministries and provincial authorities seem to be unhappy about the remarkable powers that the Royal Decree and related sub-decrees originally gave to the TSBA.

These conflicting interests and direct oppositions to the powerful role that the TSBA was envisioned to have became public in May 2009, when the Council of Ministers rejected a decree that would have defined more detailed scope for the TSBA, including its physical boundaries. According to The Cambodia Daily (2009), the reason for this was that the Council considered that “the Tonle Sap Basin Authority would have had an unreasonably expansive membership and mandate”. In August 2009, the proposed mandate of the TSBA was criticized also by the Prime Minister Hun Sen. Such a criticism led rapidly to a complete re-structuring of the authority, including removal of several senior advisors. Also the name of the authority was shortened to Tonle Sap Authority (TSA).

Overall, such changes have considerably reduced the planned mandate and geographical focus of the authority, and also moved the Authority closer to the Ministry of Water Resources and Meteorology. Consequently, the TSA is currently focusing more clearly on the Tonle Sap Lake and floodplain area, and its role seems to be closer to kind of a governmental advisory body than a real implementing agency or authority.

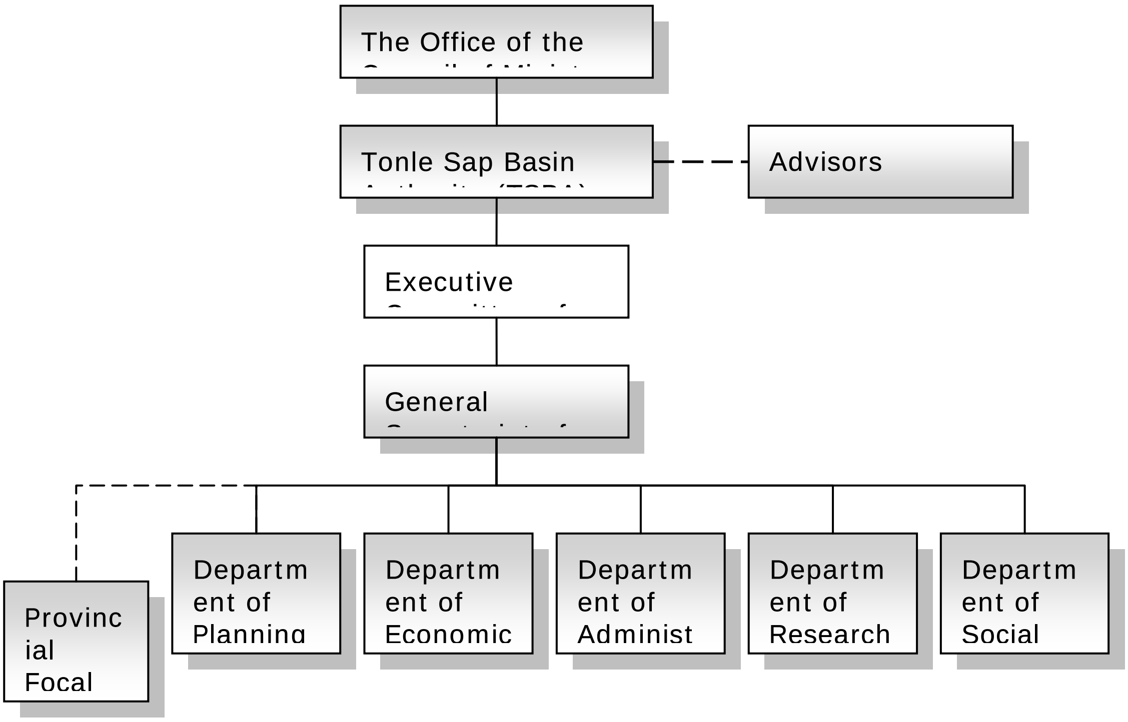

Figure 4. The proposed organizational structure of the Tonle Sap Basin Authority, as described in the Sub-decree (Royal Government of Cambodia 2008).

The TSBA was thus intended to be a completely new authority with considerable powers and a centralised organisational structure, and its objective seemed to be controlling rather than coordinating the Tonle Sap-related activities. In addition, the entire planning process for its establishment was done without proper stakeholder consultation. On the other hand the establishment of the TSBA was a government-driven and -owned process, with strong political support up to the highest levels of Cambodian government. The same cannot be said from the

TSBMO that was driven by an ‘outside actor’, namely the ADB. Consequently, the two processes provide an example of very different approaches for institution building: one based on general blueprints and driven by an external actor, and the other building more on strengthening the current political positions and driven endogenously by the actors close to the government (Molle & Hoanh 2008).

Indeed, the establishment of the TSBA has been seen as Cambodian government’s response to the frustrations related to the ADB’s Tonle Sap Initiative, and more broadly to the weak outcomes of the number of projects implemented by different international actors in the Tonle Sap area. As noted by Dr Tao Seng Hour, the Chairman of the TSBA: “A lot of money has been spent [in the Tonle Sap] but we have not seen satisfactory results so far. Coordination must be improved. We [at the TSBA] are responsible for coordinating and evaluating these projects and reporting directly to the prime minister.” (Starr 2008: 32). His views are supported by Hou Taing Eng, the then secretary-general of the TSBA: “We’ve had so many projects and programmes. But the people’s living conditions around the Tonle Sap are not yet well improved. ... The ADB recognised this was caused by a misunderstanding of cooperation among the people operating there.” (Starr 2008: 32). At the same the establishment of the TSBA is also considered to be very much politically motivated, with close linkages to the current power struggles within the government and the ruling party[24].

All in all, the establishment process of the TSBA points out how contested and political the management –and, essentially, control– of the Tonle Sap and its rich resources is. The absence of both the ADB –that through the 2000s has allocated significant amount of resources for the Tonle Sap– and the TSBR Secretariat –that have so far been the main coordinating institution in the Tonle Sap– from the establishment process is a clear indicator for the competition over the area[26]. In addition, the strong mandate planned for the TSBA is exactly the opposite to the conclusions drawn by the ADB on the kind of organisation that would best suite the current needs in the Tonle Sap (ADB 2006b). While the most optimal form of coordination mechanism for the Tonle Sap is still under debate, it seems clear that the motivations behind establishing such a powerful and centralised authority were more related to the government’s will to increase its control over the Tonle Sap’s resources, rather than to really increase the coordination and balanced development of the area.

Lessons learnt and ways forward

What kind of lessons can we draw from the Tonle Sap’s institutional setting and its development over the past years? One lesson seems clear: while the establishment of the water resources management institutions is usually justified with practical, non-political issues such as improved coordination between different sectors, the reality is quite different. Existing institutions and their rivalries together with strong political interests and hidden agendas impact enormously on what kinds of institutions actually emerge and succeed.

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[24] Personal comment (February 2009): a Cambodian researcher working on natural resources management.

[25] Personal email correspondence (March 2010): a Cambodian researcher having a long-term experience from the Tonle Sap

[26] Such a conclusion was provided by several international and Cambodian researchers during the interviews in February 2009. See also The Cambodian Daily (2009).

TSBA & Tonle Sap oil

An additional question in the establishment of the TSBA is the role that the authority has for oil and gas exploration in the Tonle Sap area – and how such plans influenced the establishment of the Authority in the first place. A Cambodian researcher having a deep understanding of the process indicated that the original decision within the government to establish such an authority "happened at the time when the speculation about the rich oil and gas deposit in the Tonle Sap reached its highest point. Office of the Council of Ministers saw [the authority] as an important instrument to control the lucrative contracts if these natural oil and gas deposits were real economically feasible"[25].

Such a view are supported by the first news about the authority, published in October 2007. The news focused on the authority's potential role in conducting studies and managing possible oil reserves in the lake area for interested investors (People's Daily Online 2007, The Vietnam Journal 2007). The news also referred to Prime Minister Hun Sen, indicating that he has "expressed his opposition to the Tonle Sap Basin being designated a World Heritage Site, saying that fishing and extraction of oil and mineral resources might be constrained as a result of its protected status" (People's Daily Online 2007).

Such views from the top representatives of the government raise concerns about the actual motivations for establishing the TSBA, and also provide a rather conflicting message on whether the stated objectives of "management, conservation and development of the Tonle Sap Basin" (Royal Government of Cambodia 2007a) will in reality get equal emphasis in the actual operation of the authority.

This has been well illustrated with the contradiction between the processes related to the establishment of the Tonle Sap Basin Management Organization and that of the Tonle Sap Basin Authority. The ADB-led plans for establishment of the TSBMO built on a relatively open planning process as well as on commonly accepted –although contested[27]– views on good planning process such as participation and decentralized governance, transparency, coordination and basin-wide approach. Yet, it did not succeed. Instead, the institution ultimately established was the TSBA that had a non-participatory but strongly government-supported planning process and whose proposed mandate is partly contradicting –rather than complementing and coordinating– those of the existing institutions[28]. The problems with the establishment process of the TSBA and its

[27] Indeed, it can be questioned how realistic the ADB's plans and objectives –building largely on a general blueprint for river basin organizations– for the TSBMO actually are and whether they in reality would have ever been met.

[28] Such a view is supported by a report written for the ADB on the TSBA (Niras 2008: vi): "TSBA may be perceived to infringe on the functions of ministries and other agencies. New coordinating bodies are frequently resisted by agencies that believe their functions are threatened. Unless it is very clear who is doing what, not only to TSBA but also to its partner agencies, their cooperation will be limited."

ultimate transformation into TSA further highlight the highly political motivations and conflicting interests in setting up a management organisation for the area.

At the same time it is obvious that any future discussions about the Tonle Sap should take into account that there now exist a completely new organisation for the management of the Tonle Sap, namely the Tonle Sap Authority. However, as the exact mandate of the authority still remain rather unclear, it is difficult to say what kind of role it will ultimately have. So far the authority has not really been able to reduce the confusion about the management in the Tonle Sap are, nor increased the cooperation between the different organisations[29]. As a result, the different organisations –CNMC, TRBR Secretariat, Fisheries Administration, MOWRAM and so forth– continue to pursue their own activities in the area, often with relatively strong –and contradictory– interests and mandates.

Yet, it is equally evident that the Tonle Sap and its resources require better coordinated planning and development – and that any coordination mechanism or process must have the full support of the Cambodian government. If the Tonle Sap Authority will maintain the strong political mandate it was given by the Royal Decree, it still has a full potential to establish itself at the center of such a process – particularly given the young, skilled and well-connected staff that is currently working for the Authority. However, achieving such a process and position requires more transparency as well as closer collaboration and better defined division of responsibilities with different institutions –both national and international– working in the Tonle Sap. The authority could also benefit from the experiences that the TSBR Secretariat, CNMC and even TSBMO have brought. In addition, considering the management needs on the ground, the Tonle Sap's management would obviously benefit from a setting that considers better the diverse needs at local levels. In facilitating such a process, for example multi-stakeholder platforms (MSPs) could prove to be a very useful tool.

Whether this kind of more open, collaborative process is actually possible is altogether a different story. The current discussions related to the Tonle Sap and the TSBA indicate that the political interests within Cambodian government towards the Tonle Sap are both remarkable and conflicting. These interests are likely to be dominating driving forces shaping the actual focus of the Tonle Sap's management, most likely at the expense of more general needs for comprehensive management. Consequently, any real change for the Tonle Sap's management will first and foremost be at the hands of Cambodian government and its different ministries and authorities.

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[29] As noted by a Cambodian researcher having a long-term experience on the Tonle Sap: (Personal email correspondence, March 2010: "The question remains if TSA can achieve what CNMC and Tonle Sap Biosphere Reserve have miserably failed so far in providing a truly [functioning] coordination mechanism" and "Cambodia already has too many layers of bureaucracy, inter-ministerial committees and agencies, and very few of them really work. The root-causes of this institutional and organizational malfunctioning have to be addressed first."

in Cambodian and elsewhere, including Pech Sokhem, Neou Bonheur, Juha Sarkkula, Matti Kummu and Olli Varis: thank you very much for that.

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Water Transfer Planning in Northeast Thailand: Rhetoric and Practice

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Abstract

Over the last decade, calls for good governance and more open, democratic planning processes have started to permeate the developing country water sector, with wider stakeholder participation in project selection, design and operation being prominent objectives in virtually all studies, policy recommendations and scholarly papers. This is in line with the observation that claims of high-quality governance pervade public-decision making rhetoric in the water sector. At the same time, contemporary analysis of planning has started to focus on the role of actors, their interaction and patterns of communication, as well as the distribution of power and agency within society, thereby questioning more institutionally embedded approaches based on ideals of rational-comprehensive planning. In this chapter, we reflect on the ways planning can play out vis-à-vis its theoretical foundations and the rhetoric espoused by major actors in water resources policy making in Thailand and the Mekong Region. We do so by reflecting on a state-led planning effort concerned with proposed massive water transfer schemes from the “water rich” Lao PDR or Mekong River to “water scarce” Northeast Thailand where the participatory reality has not matched the rhetoric.

Introduction

Over the last decade, calls for good governance and open (and more democratic) planning processes have increasingly started to infiltrate the water sector, with public participation in project selection, design and operation appearing prominently in virtually all studies, policy recommendations and scholarly papers (e.g. Rogers and Hall, 2003). This is consistent with the observation that "the quality of governance pervades public-decision making relating to policy formulation, resources allocation, legislation, rule enforcement and adjudication, making it the most important single influence on the shape and pace of institutional change in the water sector" (Svendsen et al., 2005). Also, for the last twenty years or so, contemporary analysis of planning started to focus on the role of actors, their interaction and patterns of communication, as well as the distribution of power and agency within society, thereby challenging more traditional (but ironically, strongly modernist) approaches based on ideas of technocentric and rational-comprehensive planning. Concepts like accountability, transparency and legitimacy are now being talked about in the international water resources governance discourse with regularity. Mollinga (2008) maintains that the ascendancy of the theme of good governance has brought politics into the mainstream water resources development discourse "through the backdoor".

In this chapter we reflect on the ways *real planning* - understood here as the ways planning actually occurs within a particular social, economic, cultural and political context - plays out vis-à-vis both the theoretical backdrop against which it is designed, and the competing narratives adopted by actors in the water sector of Thailand. Our focus here is primarily on irrigation development, which constitutes the main focus of several ambitious water projects targeted at Northeast Thailand, with potential (and profound) socio-environmental impacts both within the immediate region and at a wider scale, the larger Mekong River Basin of which it is part.

IWRM and Collaborative Planning: Framing the Discussion

Within the water sector, the discourses on participation in planning and management of water resources are firmly embedded in the wider arguments for Integrated Water Resources Management (IWRM). According to one often cited definition (GWP, 2000), IWRM is "a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems". USAID (2007), more recently, defined IWRM as "a participatory planning and implementation process, based on sound science that brings in stakeholders together to determine how to meet society's long-term needs for water and coastal resources while maintaining essential ecological services and economic benefits". This later definition establishes a clear link between the need for participatory approaches in planning and implementation of hydraulic infrastructure, while also stressing the need for broad involvement of stakeholders, which is uniformly recognized as a precondition for sustainable development. Some argue that "IWRM cannot be achieved without public participation" (Özerol and Newig, 2008), while others counter this view by pointing out that "participatory processes have been increasingly approached as technical, management solutions to what are basically political issues" (Gujit and Shah, 1998) and talk about a "new tyranny" of participation (Cooke and Kothari, 2001).

Planners, donors and governments quickly made use of the catch-phrases resulting from an increased literature on IWRM processes and water governance, adopting a more participatory language in recommendations and planning documents, and calls for good governance feature in most (if not every) policy recommendation and planning document. For example, the Asian Development

Bank (2003) promoted (among other key requirements for an integrated approach to water resources management) "improved governance", the *Hague Ministerial Declaration* (2000) called for "governing water wisely to ensure good governance, so that the involvement of the public and the interest of all stakeholders are included in the management of water resources", and in Thailand, the current Tenth Economic and Social Development Plan (2007-2011) specifies that "the country should have quality environment and sustainable natural resources management under the good governance principle" (NESDB et al., 2008).

Much of the changes that have taken place in the dominant paradigms to managing natural resources in general, and water more particularly, have been influenced by changes in planning theory. Natural Resource planning has long been based upon the rational-comprehensive model: scientifically-based and expert-driven, this model implicitly assumed consensus on a single objective, availability of all the data needed to support decisions and seemingly unlimited financial resources and time (Lachapelle et al. 2003). This approach has increasingly been criticised and successively altered and replaced, as the credibility of the rational planning model was widely debated and challenged (Lim 1986, Lachapelle et al. 2003). Increasingly, planning theorists have started to debate methods and programs to encompass issues of discourse and inclusiveness (Fainstain, 2000).

As early as the 1980s, Forester (1980) showed that relations of power are part of all planning exercises and argued that these power relations manifest itself in "unnecessary distorted communication". While the modernist planning project allowed planners to provide 'facts', the more inclusive and communicative forms of planning now called on planners to work with contending parties and their competing claims (Saarikoski, 2002). Since then, scholars have constantly refined understandings of planning as a communicative enterprise. As Huxley (2000) summarized "the communicative planning literature rejects as unrealistic the idea of planning as technical and apolitical, and, indeed, technical and political neutrality are seen to be incapable of achieving planning's reformative goals. Instead, planners and planning systems need to be responsive to differences, to be genuinely participatory, and to strive to create deliberative contexts, that, as far as possible, minimize inequalities of power and knowledge". Mollinga (2008) argues that "the proposition that water resources management is an inherently political process is based on the idea that *water control* is at the heart of water resources management and should be conceived as a process of *politically contested resource use*." (emphasis in original), while cautioning that water control cannot be reduced to its political nature.

At the same time as theory started to embrace participatory or collaborative forms of planning, calls for more inclusive and democratic practice started to permeate water policy documents. It has been observed that within the Mekong Region there is a general call for participation, community/collaborative models of governance, and multi-stakeholder platforms or approaches focusing on negotiations (e.g. Dore, 2007; Molle, 2007). One clear example of the close link between the newly advocated modes of water resources planning was provided by the United Nations Development Programme (UNDP, 2006) which argued that "multi-stakeholder engagement processes" (MSEPs) provide a key mechanism for avoiding political conflict and that "one multi-stakeholder approach to water management is Integrated River Basin Management[1]".

IWRM and Planning Rhetoric in Thailand

[1] River Basin Management "is a more traditional term which has recently broadened its meaning to encompass many of the same features and values which characterize IWRM" (Svendsen et al., 2005).

As a member of the United Nations, the government of Thailand has ratified the *Johannesburg Plan for Implementation* at the World Summit for Sustainable Development in 2002; by 2006 the national policy and planning developments of Thailand's National Economic and Social Development Board had been revised to be in agreement with the United Nation's framework on Sustainable Development, including the Ninth (2000-2006) and Tenth National Economic and Social Development Plans (2007-2011); and both the *Agenda 21* and *Local Agenda 21* had been implemented between 1997 and 2006. All of these developments prominently featured participatory approaches to planning, development and management of natural resources.

These wider changes are reflected in its approaches to managing water resources, with IWRM being the officially favoured water management paradigm of the country. The Eight National Economic and Social Development Plan (1997 to 2001) considered "to promote effective management, involving the collaboration of various different sectors of society, so as to achieve greater balance in ecosystem and environments" and elaborated that "opportunities will be provided for local people and organizations to play a greater role in natural resource and environmental conservation" (NESDB, 1996). The National Water Vision Statement for Thailand, released in 2001, concurred with the need for more participatory approaches in water management, and contained all parts of a progressive approach to water resources management. It reads "by the year 2025, Thailand will have sufficient water of good quality for all users through efficient management and an organizational and legal system that will ensure equitable and sustainable use of water resources, with due consideration given to the quality of life and the participation of stakeholders" (Ti and Facon, 2001). The Ninth Economic and Social Development Plan argued that "the government will try to set up the institutional framework of water administration with users' participation by transforming its strategy and operating style in order to give opportunity to stakeholders, especially local people, to participate in water resources management" (Sethaputra et al., 2001). In line with this trajectory of participatory rhetoric is the current Tenth National Economic and Social Development Plan for the years 2007-2011, which targets to build "strong communities with an inherent strategy to improve communities through increased participation, planning and knowledge management" (ITD, 2007). Equally the National Sustainable Development Strategy (NESDB et al., 2008) calls for "developing models and replicating all sectors' integrated participatory water source management and rehabilitation", and more generally aims "at developing Thailand to be a participatory society in development based on honesty, transparency and impartiality".

All of the above is evidence of attempts by policy makers and water management specialists to foster Integrated Water Resources Management approaches in Thailand, with a participatory rhetoric adopted in virtually all documents, guidelines and public speeches by a host of actors both within the country's administration and beyond. The Asian Development Bank, for example, opined that "Thailand's rich historical relationship with water has evolved in recent years into a dynamic program of integrated water resources management with participation of local stakeholders" and that, "Thailand has established itself as a leader in pioneering a participatory approach to water resources management in river basins" (ADB, 2004). Also, the quasi-non-governmental Thai Water Resources Association stated that "the integrated water resources management principle has been incorporated into the water resources management process of Thailand" (ESCAP, 2005).

Participation is a very broad term capturing many meanings and interpretations (Heyd and Neef, 2004), stretching from passive participation to information sharing, to consultation and institutionalized participation. Collaboration, as advocated by planning scholars, of course, needs to substantially differ from *passive participation* (with people being told what is happening), *participation in information giving* (with people participating by answering questions), and participation by consultation with people being consulted, while external agents define both the problems and solutions. Collaborative planning requires that problems are jointly defined, that solutions are broadly discussed and assessed, and that different types of knowledge are factored into the process of planning. Neef (2009) has argued that the concept of polycentric governance "provides a useful tool to understand many of the transformation processes within water governance regimes" by changing the responsibilities and capabilities of state and non-state actors, while shifting power and resources amongst these actors. The focus on collaboration in contemporary planning theory, apart from mere rhetoric, probably results from a recognition that 'participation' has achieved buzzword status, and that it has increasingly been reduced to "a series of methodological packages and techniques", while at the same time slowly losing its philosophical and ideological meaning (Leal, 2007).

The Lao-Thai Water Transfer

Setting the scene

Planners concerned with agricultural development in Northeast Thailand have long been concerned with the possibilities to bring more water to a region that has been consistently portrayed as water scarce for the last half century of development intervention (Molle and Floch, 2008; Blake and Floch, 2009). This, perhaps, explains the tendency for politicians and state planners to be concerned with almost exclusively promoting irrigation development to augment existing supplies with water imported from outside the region ever since the early development phases of the region's drainage basins[2]. Initially these water imports were designed to be sourced from the ambitious Pa Mong "multi-purpose" dam on the mainstream Mekong. However, as geo-political, socio-economic and environmental concerns slowly derailed that dam project, planners continued to work on other, no less ambitious plans to transfer water to the region. Briefly, these post-Pa Mong projects included (i) the "Green Isaan" project in the 1980s (Molle et al., 2009), (ii) the "Khong-Chi-Mun Irrigation Project" in the 1990s (Sneddon, 2003) and (iii) the "Water Grid" project in 2003 (Molle and Floch, 2008). This brief chronology not only sets the background for this chapter, it also framed the historical setting that a planning team "scoping for options in joint Lao-Thai water management" entered. It is this particular initiative that we are concerned with in the following section.

Visions to divert water from the lower sections of the Nam Ngum River in the Lao PDR to Thailand date back to at least 1994 when Sanyu consulting proposed to divert water from the lower section of the Nam Ngum River to Northeast Thailand (Southeast Asia Rivers Network, 2002), diverting water both to the Lam Pao Reservoir and the Nam Songkhram Basin. This initiative followed the early phases of the implementation of the Khong-Chi-Mun irrigation project, with a cascade of in-stream weirs along the main rivers of northeast Thailand implemented to capture runoff and utilize for agricultural production through large-scale pumping schemes. Importantly, while the implementation of the Khong-Chi-Mun project not only triggered popular protest within Thailand, it also was part of the reason the Interim Mekong Committee (the predecessor of today's Mekong River Commission) was discontinued (Molle and Floch, 2008). In essence, with the former basin arrangements vesting veto rights with member countries to challenge mainstream abstractions of water resources (planned under the Khong-Chi-Mun project), Thai water bureaucrats argued that a transfer from the Nam

[2] For a more complete reference of the history of irrigation planning and development in Northeast Thailand see for example: Chomchai, 1994; Sneddon, 2003; Floch et al. 2007, Molle and Floch, 2008; Molle et al., 2009

Ngum to northeast Thailand would be considered merely a tributary development, to be treated solely under bi-lateral negotiations. Sanyu (2004) later presented another version of this development option, which extended the 1994 study by including possible diversions from the other tributaries in the Lao PDR, including the Xe Bang Fai, all of which later became prominent parts of the Water Grid proposal. Significantly, it was the 2004 version of the water transfer plan that was re-discussed under the MWRAS study (described below).

The Background

In October 2004, the World Bank (WB) and the Asian Development Bank (ADB) announced that they would undertake a comprehensive assessment of the possible long-term sustainable use of water resources in the Mekong River Basin, as a basis for preparing a Mekong Water Resources Assistance Strategy (MWRAS) (BIC, 2005). MWRAS aimed to provide guidelines on the management and utilization of water resources in the Mekong Basin, "ensuring that the principles of 'balanced development' are incorporated into the water resources projects" (AMRC, 2007). In its inception phase, MWRAS focused on three target areas suitable for testing the proposed development activities, including the border section of the Mekong Basin between Lao PDR and Thailand. Seven criteria justified the selection of these target regions (WB and ADB, 2006), including: (1) economical and financial attractiveness, (2) potential to deliver multiple benefits while protecting key social and environmental values, (3) easy identification of trade-offs, (4) creating an environment to develop stronger governance institutions, (5) aggregate financial capabilities, (6) potential to build regional trust, and (7) being broadly endorsed by all stakeholders, NGOs and civil society.

The same month that an MWRAS working paper was published, a consultant to the WB also prepared an inception report titled "Scoping for Options for Joint Water Resources Development and Management between Lao PDR and Thailand in the Mekong Basin" (Consultant Report, 2006). As this study detailed with regard to the overall MWRAS strategy "work in these three regions[3], taken together, would stimulate a growing sense of cooperation, and that each country can receive benefits in a win-win perception because it generates economies of scale, builds regional trust, delivers multiple benefits and helps set up and strengthen governance institutions". Also, the report explained that "these three regions have been brought forward by the countries, and also through the bottom-up planning process of the Basin Development Program (BDP) of the Mekong River Commission Secretariat (MRCS)". Indeed, the MWRAS working paper summarized that "the Royal Thai Government has identified better water provision as its second highest national priority", especially in Northeast Thailand.

Planning for water diversions into Northeast Thailand had gained considerable momentum prior to the MWRAS. In 2003, the Royal Thai Government under then-prime minister Thaksin Shinawatra, announced that the country was to engage in an ambitious megaproject to increase the area under irrigation in the country from 4.7 million ha by a further 16.5 million ha within five years, to enable farmers to cultivate and access water around the year. The largest beneficiary of that project was to be Northeast Thailand, the electoral stronghold of Thaksin's Thai Rak Thai administration. In early 2004, however, the project came under increasing criticism (Molle and Floch, 2008): academics questioned its economic profitability and social and environmental activists predicted salinity and social equity problems would arise. Further, the massive amount of capital needed in realizing this vision triggered bureaucratic rivalries, as both the Royal Irrigation Department (under the Ministry of Agriculture and Cooperatives) and

[3] The three sub-regional areas identified included (i) the sub-region shared by Thailand and Lao PDR along the Mekong River (ii) the 3S area shared by Cambodia, Lao PDR and Viet Nam, and (iii) the parts of the Mekong Delta shared by Viet Nam and Cambodia (WB and ADB, 2006)

the Department of Water Resources (under the Ministry of Natural Resources and Environment) competed for overseeing the project with separate plans produced by each department (Samabuddhi, 2004). When in September 2006 a military coup ended the reign of the Thaksin government, the Water Grid plans were put to a temporary halt. Still, and importantly, it is this highly politicized planning environment situated between a surprise military coup and bureaucratic infighting that the appointed consultants engaged in studies to promote greater regionalisation in water sharing futures.

The Rhetoric

When the MWRAS consultancy team commenced work in 2006, it issued an inception report stating that the study would follow "a holistic, consultative and inclusive 'sub-basin' approach with a regional perspective and involve interactive phased processes" (Consultant Report, 2006). In more detail, the study team explained that the approach would: (i) take into consideration not only technical/engineering possibilities but socio-economic and environmental dimensions, (ii) reflect views of wider stakeholders through consultation and public meetings, and (iii) pay attention to upstream developments and possible impacts on the downstream basin. As such, the wording of the inception report borrowed from best practice of both contemporary planning theory (consultation, inclusive, interactive, public meetings) and the wider IWRM paradigms (multi-disciplinary, upstream-downstream interactions). But the most critical aspect of the planning endeavour was the attempt to forward a notion of collaborative and participatory planning, including wider civil society in an attempt to adhere to a best-practice planning routine.

The justifications forwarded in a second working paper by the consultancy team (Consultant Team, 2007a) summarized the rationale as a text-book case for large-scale water transfer:

> *The rich volume of water is left untapped in Lao PDR while most of the tributary basins on the other bank of the Mekong, Northeast Thailand, suffer from water shortage every year during the dry season. Both Lao PDR, which is water rich, and NE Thailand, which is water-stressed, could realise benefits equally by the consorted [sic] efforts of formulation and implementation of joint development and management of water resources and water related activities in the tributaries of and the mainstream of the Mekong.*

The case for a transboundary diversion, thereby, was inscribed and set initially: the "water- scarce" and suffering Northeast Thailand was to receive water from "water rich" Lao PDR, thereby generating a supposed win-win situation. However, the benefits for the Lao PDR were not readily apparent and were mostly seen in terms of potential payments of resources royalties, and options to foster Foreign Direct Investment from neighbouring Thailand (including potentials for large-scale concession to the private sector for developing irrigated agriculture, such as bio-fuel production). Equally in Thailand, benefits from such foreseen investments had earlier been contested when the Water Grid was initial proposed under the Thaksin administration, and did not feature prominently in the consultant's report. While the study highlighted other possible options for joint-water development[4], it is the water transfer that (maybe more than any other component) highlights the challenges of implementing IWRM principles within a historically contextualised planning environment. Of course, such an ambitious undertaking would require a considerable amount of additional infrastructure development to transfer, distribute and make use of water resources (Figure 1).

[4] Importantly, this included options for irrigated agricultural development in the Vientiane Plain and the Khammouan-Xe Bangfai Plain in Lao PDR.

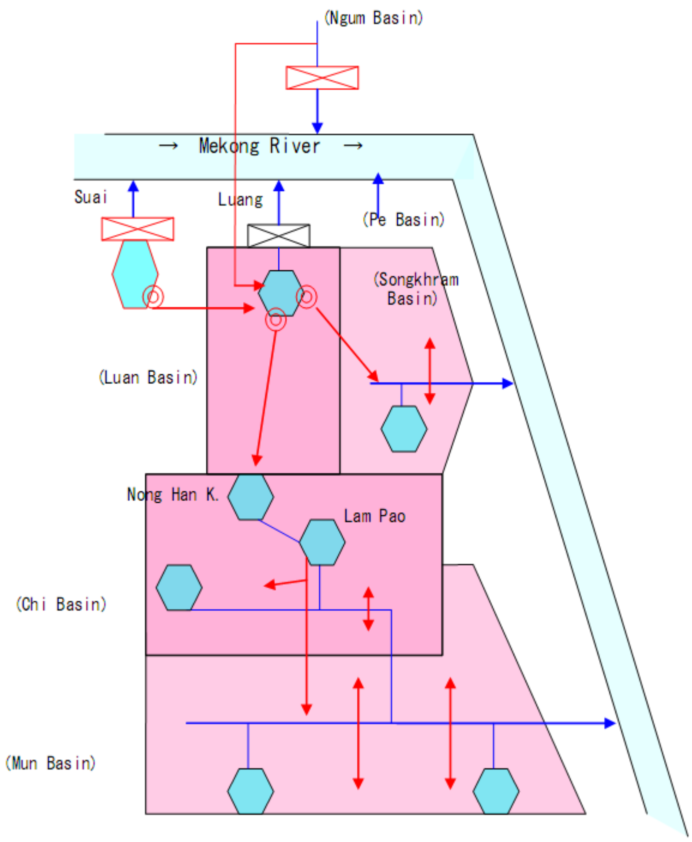

Figure 1: Option for Nam Ngum – NE Thailand Water Transfer
(Source: Consultant Report, 2007a)

The study team argued, that the positive impacts of this development option would include both flood mitigation in the Huay Luang and Huay Suai basins, as well as "assured dry season water supply for all residents for all purposes; especially for villages and farm households in Chi and Mun Basins" (Consultant Team, 2007a). In essence, this mirrored the political announcements made earlier by representatives of the Thai Government in advocating the water grid project (Molle and Floch, 2008). However, associated social and environmental costs were not discussed, even at the most basic level of estimates[5]. This neglect is, perhaps, explained by a prior study on the Nam Ngum Diversion (Sanyu Consultants Inc., 2004) which estimated total infrastructure costs at US$ 660 million, or around 0.5 THB (Thai Baht) per cubic meter of transferred water, excluding potential resource royalties to the Government of Laos. Simultaneously with the Department of Water Resource's planned cross-border water transfer project, RID have been compiling plans of their own to tap the waters of the Mekong bordering Loei Province and divert water via a series of reservoirs, tunnels, canals and other infrastructure into the Chi-Mun Basin and Nam Songkhram Basin (Thanopanuwat, 2008). Thanopanuwat (2008) stated that, "……the use of Mekong water will definitely be a powerful strategy in fighting against NE Thailand serious water shortage problem. It will serve the National Interest in every aspects" [sic].

5 Apart from the initial guesstimates with regards to benefits to Laos, the Nam Ngum River Basin Integrated Water Resources Management Plan stated that "the proposal include the opportunity costs if the water could be used for irrigation or other purposes in Laos, the possible extensive flooding of the Vientiane Plain from the barrage, a barrier to fish passage from the Mekong to the Nam Ngum Basin rivers, water security to existing and future users, water royalties and impacts for existing and possibly new tourism development" (WREA, 2009). Also, the report (p. 52) classified the risk of negative impacts from out of basin transfer as "High", with potential "highly negative impacts" with regards to the environment, fisheries and flooding. Importantly, the report does not indicate one single category that would result in positive impacts.

Public Scrutiny and Stakeholder Involvement

In February 2007, the MWRAS team of consultants invited a narrow range of selected stakeholders to a meeting at the Charoen Thani Princess Hotel in Khon Kaen, Northeast Thailand. The audience was composed of a mix of government officials from various ministries and departments, some representatives from the nascent regional River Basin Committees [6](RBC), Thai academics, and a handful of NGO and civil society representatives (most notably from the International Union for Conservation of Nature and the Thailand Environment Institute), with the consultant team[7] aiming to air their study recommendations against a 'critical' audience.

As might have been expected, the criticism that emerged within the discussion was manifold. A representative of the Khong[8] RBC argued that the study should have been transparent in the first place, and that he failed to see any valuable benefits arising from the project. Another representative from the same river basin committee felt that only benefits were presented, and questioned whether anyone will be negatively impacted. Others asked the consultants to provide evidence of successful irrigation projects in Northeast Thailand. A representative of the Chi RBC indicated the amount of prior studies produced on this issue that were not factored in the consultants' report. Representatives of IUCN pointed to possible impacts on regional wetlands-based livelihoods and other natural resources while also pointing to previous negative experiences arising from the semi-completed Khong-Chi-Mun project. One underlying question during the meeting was summarized by a member of the Khong RBC: "Do we ask the right question? Do they really need water more than other things?" (Consultant Team, 2007b). However, while the responses of the invited participants were perhaps predictable within the Thai context of contested water resource projects, the consultation proceedings were interrupted by a group of NGO protesters who took the microphone, demanding their voices be heard, arguing that, "people be informed about the project" and to "cancel the water transfer between Thailand and Laos", maintaining that "Thai farmers are getting poorer as a result of more big projects" (Protest Communiqué, 2007). It was apparent that the "public" stakeholder consultation had excluded large sectors of the Northeast Thai non-state actors with definite interests in water resources planning and decision-making processes. The views of Lao stakeholders' were not considered either, nor was there recognition of the fact that such a public protest would be virtually untenable in Lao PDR.

In the aftermath of the Khon Kaen stakeholder workshop the momentum of this particular episode in planning the Nam Ngum water diversion project, was lost, while the attention of the project portfolio resulting from the MWRAS shifted towards other potential support within the Mekong basin. At the same time, and within Thailand, the diversion of water from the Mekong or from neighbouring Lao PDR (of course) continued to rank high on the agenda, although serious questions remained as to what degree Laos was supporting the project plans. In June 2008, the then-newly elected Prime Minister Samak (widely seen as a proxy of deposed

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[6] The River Basin Committee (RBC) concept is a product of the rhetorical adoption of IWRM principles at the national level that emerged from the formulation of a national water vision and policies following the formation of the Department of Water Resources in 2002.

[7] Composed of Japanese private sector consultants, accompanied by Khon Kaen University academics engaged to prepared the Thai components under the study.

[8] "Khong" refers to all the tributaries of the Mekong River lying in Northeast Thailand, excluding the Chi and Mun river basins, which arbitrarily forms one of 25 identified river basins lying within Thai territory and used to demarcate an imagined hydro-ecological unit.

PM Thaksin Shinawatra) announced his intention to invest in megaprojects, including water diversions (Ekachai, 2008). More recently, the project to siphon water from the Nam Ngum River won cabinet approval (Wipatayotin, 2008), although it is far from clear to what extent the Lao authorities are on-board with the plans. A senior Lao irrigation official who delivered a paper at a Food and Agriculture Organisation regional conference in Vietnam suggested that it may not be necessary or desirable to transfer water to Thailand out of tributaries, but instead sell a reserved share of its flow input to the Mekong to its neighbour, claiming this was a “holistic view” and in line with MRC’s multilateral agreement on use of Mekong flows (Pheddara, 2007). Lately, under the present Thai government, both the Royal Irrigation Department (RID) and the Department of Water Resources (DWR) are engaged in preparing new detailed proposals to import water either directly from Lao PDR or by drawing from potential increased dry season flows within the Mekong mainstream itself that are expected to result from hydropower generation upstream in Yunnan. However, the Thai and Lao riparian populations and civil society at large are being kept firmly in the dark about the justifications for and details of these plans or the chance to engage in meaningful dialogue about regional water futures.

Water Resources Planning: Between Theory and Practice

While it goes well beyond the scope of this chapter to scrutinize the plethora of claims associated with water development plans of the complexity of such inter-basin or cross-border water diversions, it is equally important to discuss how planning played out vis-à-vis the ideal set out in policy documents and the rhetoric of consultants’ reports.

Collaborative planning embraces collective decision-making in ways that enhances more transparent and accountable forms of governance, allowing all participants to debate and interrogate others (Brand and Gaffkin, 2007). As such, communicative planning literature suggests that planners can foster distortion-free communication and that such communication can result in a consensus based agreement (Huxley, 2000). This has been questioned by scholars, and Mouffe (1999) even argued that free and unconstrained public deliberation of all matters of common concern is conceptually impossible. As Brand and Gaffkin (2007) explained “power differentials, a reality well recognized by many advocates of collaborative planning, cannot be dissolved through logical argumentation”. To be fair, this should not be mistaken with the fact that the pursuit of informing public deliberation could contribute to better decision-making in water resources planning. Yet, better planning relies mostly on addressing power inequalities, an issue that is hardly addressed in planning guides and policy documents as this would explicitly challenge current elites and entrenched power structures.

Thailand’s recent water development history has been marked by events of public deliberation that turned out as mere public announcement forums (Sneddon, 2003; Molle and Floch, 2008; Chang Noi, 2009), aiming to ‘educate’ an ‘uninformed’ or ‘uneducated’ rural population about the merits of a particular investment. This is at odds with attempts to build what Novotny (1999) calls “socially robust knowledge”, or public participation that goes beyond state actors (and consultants engaged by them) defining both problems and solutions. Without specific recognition of power differentials in society, IWRM and its variants such as Integrated Basin Flow Management (IBFM) are in danger of becoming no more than a managerial exercise, similar to some of the blueprint participatory processes in rural development (Neef, 2009) or be reduced to a “Nirvana” concept (Molle, 2008).

The brief workshop in Khon Kaen outlined above, which was admittedly only to present intermediate project findings, provides a case in point. Trying to channel ‘participation’ through the institutional framework of the Mekong River

Commission (and particularly its National Mekong Committees) ensured that the starting hypothesis (the problem definition) was in agreement with national goals guiding water policy in Northeast Thailand. This bias was augmented by the very definition (MRC, 2005) of stakeholders: *internal* stakeholders which are the governing bodies of the MRC and the principle line agencies of each member country and *external* stakeholders which constitute non-state bodies such as NGOs, implementing partners, civil society organizations, policy advocators, research groups, individual media, and other groups who have interest or stakes to gain or lose (Middleton, 2007). As the invitation list confirms, the consultants aimed to open up discussion to internal stakeholders, inviting members of the Thai National Mekong Committee, River Basin Committees and concerned line agencies, with only a few additional resources person invited (including the authors of this chapter). External stakeholders, importantly the extremely active wider Thai NGO community, were not invited. However, by opening up the discussion (both voluntarily and involuntarily), the planning team found itself confronted in a value discussion, that they had aimed to avoid.

It was argued that MWRAS “turned a blind eye to more complex issues” including barriers to participation and decentralization of power, vested interests and competition within and between ministries, and regional politics (Middleton, 2007). This is evident in the Inception Report prepared for the joint-water resources development which aimed to de-politicize the social history of water transfer planning in Northeast Thailand. This meant that at the time the consultant team’s offered its findings, “options” were only marginally part of the efforts, but discussions quickly surrounded the history and record of water resources development in the region, which had either been ignored or removed from sight.

Adding to this is the recognition that parties in a dispute usually not only disagree over single knowledge claims, but also employ essentially different frameworks through which they select evidence and provide it with meaning and interpretation (Saarikoski, 2002). Within the available and highly heterogeneous existing knowledge base concerned with irrigation in Northeast Thailand, planners (by the setup of the project itself) favored conventional knowledge provided by state-actors, and as such violated one core principle associated with communicative planning: that for collaborative planning there are no privileged types of knowledge[9] (Brand and Gaffkin, 2007). This, however, would have greatly improved both the quality of the generated plans and the deliberation at the workshop.

Also, collaboration is often presented as the only valid stakeholder strategy to resolve differences. However, and particularly in the context of Northeast Thailand, this neglects that stakeholders and civil society organizations might have important other strategies available to open up political space and democratize planning. As Thai political scholar Somchai Phatharathananunth (2006) pointed out, “the importance of civil society for democratic development in Thailand is more pronounced because of the exclusionary nature of Thai democracy”. In addition, the author argued that “only through political mobilization can movements build their bargaining powers and force the state to recognize them as political forces unable to be ignored”.

Of course, the above should not suggest that collaborative planning (at least in theory) does ignore the role of power in planning (see for example Healey, 2003). Dore (2007), for example, argued that power relationships embedded in the Mekong Region political context undoubtedly influence the extent that meaningful participation and negotiation is possible. However, there is evidence that powerful actors have increasingly co-opted the initial hypothesis and rhetoric, which now

[9] Within Northeast Thailand, alternative forms of knowledge production have evolved over the last 20 years, including Thai Baan research.

more often than not masks business-as-usual approaches to planning. This confirms Edmunds and Wollenberg (2002) who argued that powerful groups often manipulate seemingly neutral terms that are quickly agreed to in meetings, but then use them in ways that meet their very own needs. At the same time, the politics at work are scarcely analyzed or discussed, as water resources planning documents are invariably given a technocentric veneer, thoroughly sanitized and de-politicized.

Conclusion

Official documents on IWRM principles and practices, both within Thailand and the Mekong Region more generally, often suggest that there have been tangible shifts in planning and policy paradigms. However, there is a wide gap between the rhetoric adopted both in national and international mainstream publications advocating better planning practices and the real-politics of water resources planning in the Lower Mekong Basin (see also: Molle, 2007; Sneddon and Fox, 2007).

We have argued that at the same time as collaborative modes of planning are discursively mainstreamed, the initial assumptions are increasingly obliterated or universalised to mask complexity, as actual implementation more closely resembles business-as-usual practices. This suggests that there is a likelihood that the catchphrases of participatory planning, collaborative planning, dialogue and negotiation, which today take centre stage in international policy and planning recommendations, will witness a similar fate as other normative buzzwords and utopian (?) concepts that have pre-occupied development scholars and practitioners (such as “sustainable development” and “IWRM” itself).

Flyvbjerg (2002) argued that the use of the communicative theory of Jürgen Habermas in planning is problematic because it hampers an understanding of how power shapes planning, and that – more generally – communicative planning fails to capture the role of power in planning. As evidenced in the case of the planning for the water transfer project under the Mekong Water Resources Assistance Strategy, deliberation was initially confined to “internal” stakeholders, which frustrated the participation of the wider (and active) Thai civil society. In turn, those excluded had to use alternative strategies to open up a limited political space in order to voice their concerns within the planning efforts. The struggle for simple rights to be heard in nominally the most democratic of the Lower Mekong Basin nations, let alone rights to water resources and participation in water control negotiations, come starkly into focus in this instance.

Of course, the struggle and slow pace to move from *passive participation* to more substantial stakeholder involvement and collaborative planning is not confined to Northeast Thailand or the Mekong Basin. Wester and colleagues (2003) have made similar observations in Mexico and South Africa. Yet, Flyvbjerg’s (1998, 2002) argument that Michael Foucault’s focus on “what is actually done”, offers a type of analytic planning theory that possibly provides better prospects than Habermas’ focus on “what should be done”. In the words of the author: “If the goal of planning theorists is to create societal change which is closer to Habermas’ ideal society – free from domination, more democratic, a stronger civil society – then the first task [...] is to understand the realities of power” (Flyvbjerg, 2002). This is supported by Edmunds and Wollenberg (2002) who argued that negotiations, deliberation and participation will achieve more “if we are more open in discussing the politics at work”, and also confirms Leal (2007) who argues that “participation needs to be re-articulated within broader processes of social and political struggle”. Ultimately, the inherently political nature of water resources planning, management and control underpins all decisions and is hard to escape in the real world.

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People' EIAs as a new approach for water governance: Case of Hua Na Irrigation project in Northeast Thailand

Kanokwan Manorom

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Abstract

This article aims to introduce the concept of a People's EIAs as a model for a more participatory and transparent EIA process that can be potentially used as an innovative consensus-building tool for water governance. Direct experiences of participatory action research implementing of a People' EIA entitled *Social Impact Assessment of Hua Na Irrigation project of Si Sa Ket Province in the Northeast region of Thailand* by the author is presented in this article. The project had been carried out during January 2008-August 2009 and was funded by the Royal Irrigation Project. Based this project, a People's EIA greatly facilitates water governance as it allows stakeholders to participate in all steps of the assessment including developing issues to be studied, data collection, analysis, rechecking and writing a report in a more accessible manner allowing all stakeholders to understand. People also participate in a consensus building on impacts, mitigation plans and measures, implementation of mitigation plans and measures, decision making and long term impact monitoring. Therefore, it is believed that a People's EIA will be a good lesson learned as pressure mounts throughout the Mekong region for large infrastructure projects lessons can be learned from those which have experienced serious problems in recent years, and have sought ways to resolve them.

Improvement of EIAs in Thailand

Over the past 20 years, the widespread environmental destruction and social dislocation associated with many large-scale water infrastructure projects have been the source of numerous conflicts in Thailand. A key point of controversy has been the lack of full, reliable and comprehensive assessments and analyses prior to project construction.[1] In theory, EIAs should provide an accurate prediction and assessment of the impacts of proposed large-scale projects, to help determine whether they should proceed at all. Critics further argue that political influences on supposedly neutral science and expertise have yielded unbalanced research on environmental and social impacts.[2] In Thailand, as in other countries, EIAs have often been depicted as an exercise in rationalising pre-determined outcomes, rather than providing independent and rigorous analysis upon which sound decisions should be made.

In addition, underestimation of social and environmental costs and exclusion of local perspectives on anticipated benefits, costs and social consequences of projects, have led many local communities, NGOs and academics to mistrust and question the veracity of EIAs, case such as the mega project the Kong-Chi-Mun Inter-basin Diversion Scheme (KCM) that was approved in 1989 by the Thai government.[3] The Council of Ministers of the Chatichai government passed a resolution to approve the construction of this project and asked the Department of Energy and Development Promotion (DEDP), under the Ministry of Science and Technology, to complete feasibility studies by 1992. The study that was later presented and suggested that it was technically feasible to irrigate 4.98 million rai (796,800 ha) in 15 provinces of Northeast Thailand, with construction being envisioned in three successive stages over a period of 42 years.[4] The KCM was transferred to the Royal Irrigation Department (RID) under the bureaucratic reform in 2002.

However, this huge project has been continuously debated and criticized overtime by NGOs and academics about its impacts and cost effectiveness that has never been assessed thorough EIAs. Further, contested understandings of the costs and benefits associated with large dam projects have resulted in social conflicts at multiple levels, displacing and dividing communities. A key point of controversy has been the lack of comprehensive environmental and social assessments prior to project implementation such as such as Rasi Salai weir project.[5] Other example is the Pak Mun hydropower dam located near the KCM shows how entire communities lost their sources of livelihood and how the project has failed to secure people's livelihoods and the environment.[6] It has been said that if the full

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[1] Parichat Sivaruk. 2002. EIA: State of Knowledge, Problems and Alternatives. Bangkok. Thailand Research Fund.

[2] Thongchai Panswad and Pranee Pantumsinchai. 2004. Improvement of EIA Process in Thailand. Last accessed Nov 06 www.eeat.or.th/articles/ImprovementofEIA.pdf

[3] The idea of this project was to divert water from the Mekong mainstream to store up in the Chi and Mun river basins. By doing so, at least 18 irrigated projects (weirs and dams) could be continuously constructed. The project was planned for completion within 42 years and divided into three phases Chainarong Sretthachau, Kittima Nungern and Anna Olsson. Social Impacts of the Rasi Salai Dam, Thailand:Loss of Livelihood Security and Social Conflict. in http://www.searin.org/Th/RSD/rsd_wcd_e1.htm

[4] Philippe Floch, Molle François and Loiskandl Willibald . *A Chronology of Irrigation Development in the Chi-Mun River Basin, Northeast Thailand*, (Working Paper) in http://www.mpowernet.org/download_pubdoc.php?doc=3629

[5]Sanan Choosakul et al., 2006. Community Rights Studies: Cased of Mun-Chi River Basins. Thailand Research Fund.

[6] Two EIA for Pak Mun were completed in 1982 and 1984. However, the EIA related to a dam design entirely different to that which was built and at a location

costs and impacts of these projects were accounted for, neither these projects would have been built.[7] Not only the large scale project, but also medium and small scale water projects have problems of lacking of an impact assessment as the later two require only an Initial Environmental Examination (IEE), which bypasses the Office of Environmental Policy and Planning.[8] In sum impact assessments in Thailand rarely involve people in the assessment. Therefore, this limited space for local people and the public to articulate their concerns regarding impacts of huge water infrastructure projects, let alone frame the issues of importance calls for an urgent review of the EIA process.

Thailand's EIA legislation has been amended many times. Thailand was one of the first countries in Southeast Asia to legislate for a national EIAs process. Since its adoption in 1981, laws and regulations regarding EIAs have undergone numerous amendments, the most recent being the Enhancement and Conservation of the National Environment Quality Act enacted in 1992 (NEQA 1992). The Act includes provisions for specifying the type and size of projects that must submit the EIAs, as well as prescribing two separate EIA procedures depending on whether a project requires Cabinet approval or not.[9]

Whilst the NEQA 1992 is an improvement on previous legislations on EIA procedures, it still faces a number of shortcomings. For examples, a number of

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nearly one kilometre downstream. In the case of Rasi Salai dam, no EIA was ever conducted prior to its construction. A post-project EIA commissioned in 2002.

[7] Philippe Floch, Molle François and Loiskandl Willibald . *A Chronology of Irrigation Development in the Chi-Mun River Basin, Northeast Thailand*, (Working Paper) in http://www.mpowernet.org/download_pubdoc.php?doc=3629

[8] Unlike the Environmental Impact Assessment, an IEE do not need to be submitted to the Office of Environmental Policy and Planning (OEPP) for approval as stated in the National Environmental Quality Act 1992, Section 46-47. Projects or activities listed in the legislation including dams or reservoirs with a storage volume of 100 Mm^3, or storage area of 15 km^2 or more that need to prepare EIA Reports (OEPP 1998).

[9] Thailand's EIAs have incorporated many legislations is partly due to the movement for social reforms following the military coup d'état of the previous year, the government abolished the 1975 National Environmental Quality Act and replaced it with The first mandatory provision for EIAs, 1981 Under Sec 46 of the Enhancement and Conservation of National Environmental Quality Act (NEQA) 1972 (2515) and later the improvement in The National Environmental Quality Act 1992 (2535), section 46-47 (Bantita Pitchyakorn 2006:65).[9] The Environmental Impact Evaluation Bureau (EIEB) under Office of Natural Resources and Environmental Policy and Planning (ONREPP) is responsible for specifying the types of projects that require EIAs and undertaking the preliminary review of submitted EIAs and making recommendations to the Expert Review Committee who will make the final judgment. The EIEB is also responsible for monitoring the environmental performance of projects after the EIAs has been approved. Twenty two types of proposed projects or activities, ranging from oil refineries to medium sized hotels and condominiums must be mandatory to conduct EIAs.

[9] It is also required that all large-scale dams require cabinet approval, and an EIA must be submitted at the project feasibility stage and conducted by registered consultants in accordance with guidelines issued by the ONREPP. All large dams with a reservoir volume exceeding 100 million cubic metres or surface area of at least 15 square kilometres; or irrigated area of at least 80,000 *rai* (12,800 hectares) must submit an EIASSS .For more information on procedures and institutional structure of EIASSS in Thailand, see: the ONREPP website <www.onep.go.th/EIASSs/ENGLISH/EIASSs_eng_index.htm>

small and medium-scale projects with potential social and environmental impacts are not required to undertake an EIA. There is also an insufficient emphasis on the social impact assessments in the EIA procedure. Moreover, the EIA is a government-controlled process. There are very limited avenues for genuine public participation throughout the entire EIA process – from its inception, when project developers scope and formulate the terms of reference, through to the report review process, undertaken by government agencies and government-appointed committees.

Thailand has tried to improve EIA's regislation by intregrating a concept of people's participation. The Thai constitutions of B.E. 2540 (1997) and B.E. 2550 (2007) added a concept of people's participation in the protection of the environment, social, health culture and local livelihoods[10]. The right of access in information on EIAs by the affected people was prescribed in the constitutions. The constitution says that "a person shall have the right to participate in the decision making process of State officials in the performance of administrative functions that affect or may affect his or her rights and liberties, as provided by law". This is confirmed later by the 2003 Royal Decree on Guidelines and Procedures on Good governance which states that the arranging of public hearing prior to the operation of the project must be made.[11] The EIEB joined with World Bank to draft the "Guidelines on participation and Social Impact Assessment in Environmental Impact Assessment" in 2006. This guideline prescribed about principles of EIA, meaningful people's participation in EIA such as principles of stakeholders' participation, transparency, and accountability, and decentralization, local knowledge, mitigation measures to restore unintended consequences, health problem, and fair compensation and so on. In addition, the guideline states that public consultation also must be a critical part of the process and the views of local residents and other stakeholders should be included via surveys and public meetings so that their concerns can be addressed in the EIA report.[12] So the people's participation in Thailand's EIA is required by law.

Royal Irrigation Department and PEIAs

The Royal Irrigation Department (RID) is one of government agencies responsible for irrigation development in Thailand[13]. This agency is responsible for construction of many kinds of irrigation projects and flood protection. They include a construction of run-off-river diversions of mall to medium and large scale irrigation schemes, an operation of mobile pumps wherever possible and needed and flood-protection projects, with the main objective to create schemes that would supply additional water for wet season agriculture. In the Northeast region, the RID firstly commenced its construction efforts in the northeast Thailand in 1939 with the construction of pilot irrigation tank projects and run-off-river diversions which caused a major change with regards to water resources developments in the region in order to provide multipurpose water resource development for economic growth in the region. [14] The RID's irrigation projects

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[10] Office of Prime minister. The Public Hearing protocol 2006. (Black paper).

[11] Bantita Pitchyakorn. 2006. Bantita IUCN. 2006. Mekong Region Water Resource Decision Making: National Policy and Legal Frameworks vis a vis World Commission on Dam Strategies Priorities. Bangkok. Chung Wicha Press.

[12] www.onep.go.th/EIA/ENGLISH/about_eieb/about_eieb.htm

[13] Mingsarn Kaosa-ard. 1997. Water resource management policy in Thailand. National Research Council.

[14] Philippe Floch, Molle François and Loiskandl Willibald cited in http://www.mpowernet.org/download_pubdoc.php?doc=3629

were less criticized as its utilization has been fruitful and impacts are not extensive.[15]

However, after the RID was granted the former DEDP's projects including the KCM, (the Hua Na weir is of the KCM projects), and other pumping stations operated in the Northeast region, the RID has been under pressure as these projects have long been criticized by local people, academics and NGOs with inefficiency in function. The RIDP has been pressured by many factors including a movement of the Assembly of the Poor (AoP)[16] on redoing the EIAs with participatory manner to reassess of impacts of these projects on local livelihoods and ecology, a fair on financial compensation, a new approach of the EIA's legislation and 2006 guidelines and the maximization of utilization of existing of irrigation projects under the KCM that were already contrasted.

With all the mentioned pressures that the RID had, they started to find solutions how to resolve the conflicts by taking the most urgent project proposed by the AoP, the Hua Na weir to be assessed regarding environment, social and health impact assessment. RID and academics discussed how to start an assessment. Concept of participatory impact assessment, mentioned in the 2006 new EIA's guidelines and offered by the AoP and academics were accepted by the RID as it was a consensus building tool for solving conflicts regarding EIAs. Details of a People's EIAs (PEIAs) will be described in the later section after background of the Hua Na project is presented.

Hua Na weir and its controversies

The Hua Na weir is located on the Mun river. It is one of the projects under the KCM inter-basin water diversion scheme. The weir is a channel storage dam which is approximately 90 kilometres downstream of the Rasi Salai wier and 160 kilometres upstream of the Pak Mun hydropower dam. Initially, the government claimed that Hua Na dam would be a 4-metre high rubber weir, which could be deflated during the wet season to minimise flooding. Instead, a 17-metre high concrete dam spanning over 200 metres with 14 gates was built, making it the largest dam in the KCM.[17]

The Hua Na project was approved by the Thai government in 1989, the dam intended to provide irrigation to 61 communities in five districts in Si Sa Ket province.[18] Since, the Hua Na project was approved; two main canals with the total length of all the canals of 88.85 kilometres were already completed in 2003. The 21 ditches were also built. About 10,000 households located along both canals have waited to utilize water. Expected irrigated areas of the Hau Na project are 77,000 rai.[19]

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[15] Philippe Floch, Molle François and Loiskandl Willibald cited in http://www.mpowernet.org/download_pubdoc.php?doc=3629

[16] Assembly of the Poor was established in 1995 which became a highly influential force within four years. The AoP, supported by many NGOs and academics, claimed that the commissioning of the dam (through closure of the gates) had harmed their livelihoods as it had prevented migration of fish from the Mekong and had inundated their river bank gardens. The AoP used a variety of methods to pressurise successive Governments over a decade.

[17] Department of Energy and Development Promotion. 1996. Hua Na Weir Project. Bangkok.

[18] Department of Energy and Development Promotion. 1996. Hua Na Weir Project. Bangkok.

[19] Department of Development and Energy Promotion. 1996. Hua Na Weir Project. Bangkok.

Although the gates were installed in 2000, and over 2.1 billion baht was spent on the project, the Hua Na scheme has yet to be utilised because of opposition from local communities living near the river. [20] With the support of NGOs, local communities have successfully stopped the dam from being put into operation. A main point of contention is that a proper EIA was never conducted prior to construction. Initial Environment Assessment made by a consultant Company was unacceptable by EIEB and AoP as it was not properly done with an in-depth, comprehensive and participatory EIA.[21]. That EIA did not present the dependence of people on the *Pha Boong Pha Taam*, local name for wetlands which are very important resources for local livelihoods.[22]

For the AoP, they also expressed their concerns about a problem of salinization of soil that may potentially spread throughout the region as it is estimated that there is 19.4 million rai[23] (3.1 million ha) of land at risk of becoming saline in the region.[24] The salinization is an endlessly critical issue for lots of debates among academics, government and NGOs regarding scepticism on how this problem will affect ecology and people's livelihoods if irrigated areas are greatly expanded.[25] In addition, there is a criticism made by both NGOs and academics about an inefficiency of water development schemes that are provided in the region. A number of the proposed schemes (some completed, some planned) are on a very large-scale and include the 'Accelerated Rural Development Programme', the 'Greening Isan' project, the 'KCM' and the 'Water Grid'. All are based on the questionable assumption (held by successive governments) that poverty in the Northeast region is drought induced and can be overcome through large-scale schemes[26]

Further, this scheme has not only caused conflicts between the government and local communities but it has also been a source of tension between farmers awaiting their promised water and those who fear their livelihoods will be adversely affected by the dam. A great number of farmers (about 10,000 households) are waiting for the benefits of irrigation that the government promised, and appear not to be concerned about an EIA, as long as they can get the water to begin irrigation. Currently when facing the water shortage during early rice cultivation, the pro group collectively proposed their needs to the village head and then the village head presented the list of farmers' names who needed water for seedling to the Sub-district (Tambol) Administrative Organization (TAO) for help. The TAO coordinated further with Si Sa Ket Irrigation Project (SIP) to pump water at the pumping station directly from the Mun river to the existing canals. [27]

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[20] Assembly of the Poor. 2000. 16 Problems of the Assembly of the Poor. Bangkok. KangHun printing. (In Thai).

[21] Assembly of the Poor. 2000. 16 Problems of the Assembly of the Poor. Bangkok. KangHun printing. (In Thai).

[22] Sanan Choosakul et al., 2006. Community Rights Studies: Cased of Mun-Chi River Basins. Thailand Research Fund.

[23] 1 hectare = 6.25 rai

[24]Arunee Yuvanikhom in http://www.sri.cmu.ac.th/~environment/Download/050505.pd)

[25] Sanan Choosakul et al., 2006. Community Rights Studies: Cased of Mun-Chi River Basins. Thailand Research Fund.

[26] Philippe Floch, Molle François and Loiskandl Willibald cited in http://www.mpowernet.org/download_pubdoc.php?doc=3629

[27] Kanokwan Manorom, Surasom Krisanajutha and Noporn Chaungching. 2009. Social Impact Assessment of Hua Na Irrigation project of Si Sa Ket Province in the

Hence, local people are concerned that they will experience similar problems to that of communities affected by the Rasi Salai weir, located approximately 80 kilometres upstream. Like Hua Na, the government claimed that Rasi Salai weir would be a rubber weir with minimal impacts, and no EIA was conducted prior to construction.[28] Once the gates were closed in 1994, the nine metre high concrete weir created a reservoir stretching 120 kilometres which submerged more than 8,000 hectares of surrounding wetlands, causing severe impacts on local communities.[29] Moreover, the promised irrigation benefits never materialised, with the water too saline to be used for irrigation.[30]

With the above argument, approximately, 7,000 villagers joined protests by dam-affected communities in Rasi Salai weir and Pak Mun dam under the umbrella of the AoP to call on the government to address their concerns. With the support of NGOs, the AoP demanded that proposed that the PEIA was simply a mechanism for the Government to record the extent of their resource dependence. This mechanism included the need to conduct a full EIA using a participatory approach, establishment of a fair compensation scheme, a monitoring framework for all future possible impacts and appropriate solutions for any losses incurred – all of which must be addressed before the project begins operation. To help resolve the conflict and facilitate a decision on the future of the Hua Na weir, the RID has accepted an EIA, inclusive of the principles of the people's EIA, should be conducted. In addition, the AoP and NGOs.[31]

The PEIA experience at the Hua Na project

The PEIAs at the Hua Na project was actually been started after the RID was granted a budget from the government in late 2007. This budget availability was a result of the force from the AoP's who sent the proposals demanding on implementing the EIAs based on the amendment of the NEQA 1992 in the year 1999 32 and later in 2001. In responding to the AoP, the government, the newly created Minister of Natural Resources and Environment appointed a Steering Committee on Monitoring the Participatory Impact Assessment (SCMPEIA) to monitor and supervise the process of conducting a full EIA in 2003. 33 With the

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Northeast region of Thailand. Research project. Ubon Ratchathani University. Thailand.

[28] Although a feasibility study for the Hua Na project was conducted in 1992 by Asian Engineering Consultants Company and TEAM Consulting Engineering and Management Company, which tried to be passed off as an EIASSS, it was rejected because the EIASSS was not in accordance with guidelines and regulations prescribed by the NEQA 1992.

[29] http://www.searin.org/Th/RSD/rsd_wcd_e1.htm

[30] Sanan Choosakul et al., 2006. Community Rights Studies: Cased of Mun-Chi River Basins. Thailand Research Fund.

[31] Kanokwan Manorom, Surasom Krisanajutha and Noporn Chaungching. 2009. Social Impact Assessment of Hua Na Irrigation project of Si Sa Ket Province in the Northeast region of Thailand. Research project. Ubon Ratchathani University. Thailand.

[32] AoP offered 4 proposals to the government including The AoP sent petitions and declarations to the government demanding: 1) impediment of the project construction, 2) the implementation of an EIA in accordance with the amendment of the NEQA 1992 and 3) just compensation for the losses of local people.

[33] The SCMREPP was established comprising of NGOs, prospective affected villagers, neutral academics, involve line agencies, including staffs and experts from the RID, EIEB and ONREPP. The established SCMPEIA provides neutral space for involved stakeholders. The SCMPEIA plays a crucial role in advising,

force of the AoP's movement supported by the New EIA legislation and the 1993 Thai Constitute, the RID accepted to reassess with the compromise that this EIA of Hua Na would be an inclusive of the principles of the people's EIA as mentioned earlier.

In late 2007, the RID called for the meeting with all involved parties including affected people, beneficiary groups, NGOs, RID officials, and local interdisciplinary researchers from three universities who were selected by the RID to do the assessment.[34] All parties especially constructively discussed the process of PEIAs as all believed and expected that PEIAs would be the best tool that could resolve the persistent conflict between the affected and beneficiary groups in relation to impact assessment and utilization of the project. For example, the affected group wanted to obtain very clear, solid and accurate information such as flooded areas, amount loss of wetlands while beneficiary group wanted to utilise Hua Na project.

In addition, the academics offered the idea to local people that villagers both affected and beneficiary would be part of the assessment team in order to achieve the participatory EIAs. It was an agreement also that academics and research villagers (both from affected and beneficiary camps) would collect and analysis data. The discussion about whose villagers to be part of the team went on. Villagers proposed that villagers who would be researcher must be ones that had great interest and willingness to join the research team. They should possess leadership characters. They were able to help to shape guideline questions for interview, take short notes, ask questions and coordinate with other villagers and academics, to check data and to support academics in analyzing data. All these criteria for selection of the villagers were agreed and 21 villagers were selected from both groups to work with academics.

Then, the processes of PEIAs were widely discussed by stakeholders to build a consensus on how people and publics participated through six steps, details of which are explained below.

Step I: Agreed issues to be studied

Step II: Data collection, analysis and rechecking

Step III: Consensus building on impacts, mitigation plans and measures

Step IV: Implementation of mitigation plans and measures

Step V: Decision making

Step VI: Long term impact monitoring

Step I: Agreed issues to be studied

Before starting the PEIAs, the RID called for the meeting among academics, NGOs and local people to discuss how the PEIAs should embark. Academics suggested that agreed issues by all stakeholders to be studied must be a starting point. Academics helped the RID by facilitating a series of local-level workshops and focus group discussions on the agreed issues to be assessed with a diverse range of stakeholders including local officials, the project developer, and villagers (including those who agree and disagree with the project). The discussion about

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commenting, suggesting the assessment team and later they are authorized to endorse the report before sending it to the ONREPP if the report complies with the guidelines and procedures prescribed by EIEB and ONREPP. They also propose the final agreed report to the National Environmental Committee and to the cabinet to approve the project.

[34] Local universities participated in PEIAs included Ubon Rathchathani University, Suranaree University and Khon Kean University.

the agreed issues to be studied traced back to Feasibility Studies (FS) made in 1992 by the consultant company[35] what critical issues that were left out from the study as the company tended to focus on the guideline prescribed by the ONREPP and how the critical issues would be added in the study.

Affected people and NGOs presented that the FS pointed to a number of weaknesses in the EIA guidelines made by the ONREPP, in addressing the deep inter-linkages that exist among issues of land use, community rights and utilisation of natural resources such as fisheries and wetlands.[36] For instance, the four issues – physical resources, ecological resources, human use values, and quality of life values – outlined in the guidelines, which must be assessed by all projects requiring EIAs, tend to be disconnected and rigid in its approach and analysis, without sufficient consideration of the diverse social, economic and cultural contexts in which projects are to be implemented.

Therefore, affected people and NGOs suggested that the issues to be studied must cover all dimensions of people's livelihoods such as degree of level of dependency on wetlands and vulnerability to change in wetlands, possible impacts in relation with flooding areas, compliant and anxiety regarding flooding and loss of livelihoods, compensation and mitigation plan, measures, implementation, social impact monitoring and etc. These issues were agreed upon by all parties as all perceived that those issues were very critical as they were key issues that provide data that all need to know for making decision about the project.

These consent issues were presented to the SCMPEIA. The SCMPEIA accepted the them as they endeavoured to include diverse local perspectives and situations – farmers awaiting their promised irrigation benefits; local people whose lands (including those with and without land title) would be permanently submerged by the dam; and local people whose access to common resources, such as grazing land, seasonally flooded forests, and fisheries would be affected by the dam. The preliminary assessment and identification of different perspectives ensured that a more comprehensive and holistic list of issues and concerns were generated. These issues were then presented at a public forum, overseen by an independent advisory board, providing a space for stakeholders to participate in the decision over which issues required further study.

Step 2: Data collection and analysis

Academics proposed that besides household surveys, participatory action research, rapid rural appraisal and participatory rural appraisal were also employed for data collection as suggested by the 2006 EIAs's guidelines. Research villagers agreed and were responsible to contact key villagers for focus group discussion and interviewed individual key informants with a support of academics. Questionnaire for a household survey was drafted and commented by research villagers and NGOs especially on critical issues of livelihood activities in relation to wetland resources, fishery, grazing land and pottery making. Then, academics discussed a way to analyze data with research villagers. Finally the team reached the conclusion that linking local knowledge to expert knowledge would be the best way to analyze data. As one research villagers who was member of the AoP said that

[35] This FS was revised this studies in 2001 but this report was rejected as it was unsatisfactory as it did not take into account all the important critical issues associated with local livelihoods and unclear social impact assessment.

[36] Assembly of the Poor. 2000. 16 Problems of the Assembly of the Poor. Bangkok. KangHun printing. (In Thai).

“when doing data analysis, we must realize about a significant problem which is how much clearly the Hua Na project will give impacts to us and how the project will give us benefits. Taking our knowledge into the analysis is the best way to do. These are the things that must be the heart of the analysis”.

In addition, various techniques were used to incorporate local knowledge with so-called “scientific knowledge”, such as the combining of community natural resource mapping with maps in project studies to help determine the extent of impact from inundation if the weir was to commission. To write the EIA’s report, academic drafted the report. The study team agreed that the PEIAs’report should be written in a way that it was more accessible by local people and the public. In the report, incorporation of local and scientific knowledge is encouraged.

Step III: Consensus building on impacts, mitigation plans and measures

Building consensus on impacts, mitigation plans and measures were also made during the assessment. For example, affected group was keen to discuss how the impacts would be based on their past experiences they faced serious flood in some years. At the same time, academics presented the simulation hydrological data. Interdisciplinary team integrated all data. Social scientists fed data on livelihood’s pattern and local knowledge on hydrology, fishery, pattern of resource use and management into the database of the hydrologists. For example, flooded areas were very interesting to raise here as this issue was the most arguable one in the history of the Hua Na project which all parties including the AoP and RID really wanted to know changing upper flood limit in relation to changing different MSL (the study team simulated 6 levels of upper flooding limit starting from +112; +113; +114; +115; +116; and +117 MSL). [37]

They expected that this data would indicate what water level kept was the best for all farmer’s groups. Then hydrologist simulated flooding data and proposed that + 112 MSL was the best water level to be stored in the reservoir as it would not flood a large amount of forest, wetland and farming areas and there would be abundant water available in dry season. This simulation was done by incorporating local knowledge on flooding history that villagers had observed. The produced maps of the +112 MLS were given to the AoP and leaders of each groups and explained by hydrologist. Villagers understood about the upper flood limit and areas where would be inundated. Finally the accepted +112 MSL was agreed and presented to the SCMPEIA and the RID by the study team. Both of them concurred with this proposal.

In addition, the study team with the agreement from local people discussed how the Hua Na project would be managed to meet the need of all stakeholders at the same time this operation must correspond with ways in which other water projects located upstream (Rasi Salai weir) and downstream (Pak Mun Dam) of the Hua Na project operated. Basin management was then raised as the concept for the project management. As explained elsewhere that the Hua Na project is located in the middle part between the two dams, management of this project must be influenced by other existing projects in the basin, such as through changes in water flow. Therefore, stakeholders offered that a management of the Hua Na project had to consider the ways other dams or/and irrigation project are currently operated in order to avoid the adverse impacts of the flow and inundation within the same catchment.

For the mitigation plan and measures, the AoP and NGOs offered idea of how PEIA would work for them if the Hua Na project was approved and commissioned. Both of them proposed the followings:

[37] Suranaree University. 2009. Environmental Impact Essessment of Hua Na Irrigation Project.

Affected people, people's organizations, civil organizations (such as Sustainable Agriculture Organization or Wetland Organization working in the areas) and NGOs could propose major mitigation plans and measures that were relevant to the development projects that these people were now working on which were very successful in improving local people's livelihoods for along time.

People and NGOs must join the implementation of these plans with all involved government agencies. The engagement of people and NGOs would create sense of ownership and belongings of local people in the project developments and sustainably keep the mitigation plans and development activities.

The government and academics supported people budget, training and update information on development.

These proposals were acceptable by the SCMPEIA and the RID. Examples of these mitigation measures included community fund, organic agriculture, and community forestry and etc.

Step IV: Implementation of mitigation plans and measures

Many mitigation plans and measures proposed by people previously mentioned were agreed by the RID that they would be implemented by local people and their organizations supported by NGOs and academics. In the meeting with the SCMPEIA, there was an agreement that these mitigations would be started soon after compensation was completely made to the affected people.

Step V: Decision making

The stakeholders pointed out that the Hua Na's PEIA must be used as a consensus building tool to convince a decision making bodies before deciding if the project was implemented. The RID was part of the SCMPEIA who always attended and advised the study team in all the meetings organized. Being part of the committee, the RID had learnt that the Hua Na project was not sustainably used if EIAs were not clearly undertaken through an open and participatory process.

Based on the experience working in the Hua Na's assessment, the final draft of the PEIA report was presented to all stakeholders before handling to the SCMPEIA. This platform provides all stakeholders to address their concerns and comments on critical results of the study. Most importantly, this arena was the negotiating space of both the pro and the con groups to make a consensus building on water allocation and project management with regarding to seasonal changes, upper flood limit, compensation schemes and post monitoring of the agreed implementing programmes. The consensus building served as the springboard for decision making at the higher level. Then the study team incorporated and revised all the concerns, suggestions and recommendations given by stakeholders into the drafted report. The revised version of the report was then submitted and later presented to the SCMPEIA and to the cabinet. RID was confident that the initial decision made by them as the project owner and as part of the SCMPEIA, somehow would help to ensure that the cabinet would agree that the project should be approved and operated in a sustainable manner.

Step VI: Long term impact monitoring

The study team, SCMPEIA and stakeholders especially the NGOs discussed about long term impact monitoring of the Hua Na project**.** The stakeholders agreed that as this project was likely to be approved by the cabinet, the planed monitoring of the mitigation measures and the project management must be undertaken every 3 years by independent group. The results of the monitoring must be reported to all stakeholders.

Lessons learned

The case of PEIA of the Hua Na project gives very good lessons to those who are involved with impact assessment and water governance. The given PEIA case shows that PEIAs is not a mechanism to slow down project planning and implementing. Rather, it is a useful tool to evaluate, in advance, the different problems, perspectives and interests by allowing grassroots people and wider publics to interactively participate in the EIA process. As pressure mounts throughout the region for large infrastructure projects lessons can be learned from those which have experienced serious problems in recent years, and have sought ways to resolve them. It is clear from the experience of the Hua Na and other large projects in Thailand that the value and legitimacy of the EIA process in assessing social and environmental impacts hinges on the adoption of methods that safeguard the participation of multiple voices and perspectives. Therefore, PIEAs are innovative tool that provide in-depth information for decision makers to achieve water governance as they provide consensus building on water management allowing a more participatory assessment, as defined by the legislation. It also tends to open wider opportunities for publics to articulate or represent the interests regarding impacts of the projects and water management.

Recommendations and conclusions

The experience with the people's EIA model in Hua Na, both highlights a number of weaknesses and complies with new approach of EIA in Thailand's EIA procedure, and provides a means to facilitate genuine participation in the process. The PEIA model in Hua Na has, thus far, been positively received by a range of stakeholders including local people, NGOs and the project developer. Although the entire PEIAs may not be suitable for other countries in the Mekong Region, there are many parts of it that could be incorporated into similar approaches. For example, if projects are to incorporate local (as well as government) perspectives participatory action research can be used to establish agreed issues to be studied before EIAs begin.

In sum, PEIAs facilitate participation in the EIA process, by creating a space where local people can frame and articulate their needs, values, and priorities. PEIAs allow stakeholders to broaden the issues to be studied and resulted in more in-depth scoping. The PEIAs focus on the issues identified by all stakeholders and on the links between the changing environment and people's livelihoods. Public consultations involving all stakeholders, an active advisory board, frequent reporting, and participation in various stages of decision-making are key dimensions of the PIEAs. Therefore, a fundamental principle of the PEIAs is the inclusion of the different values and needs of diverse stakeholders from the PEIA's inception, where potential impacts that need to be studied are identified.

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Contentious decision making around Pak Mun Dam
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1. Abstract

This paper reviews contentious decision making around Pak Mun Dam, Thailand's most controversial dam, in operation since 1994. Following Pak Mun's approval in 1989, debate and mobilization around its benefits and impacts accompanied the dam's construction and operation. The analysis covers a series of 14 decisions, beginning with decisions to design and propose a particular kind of dam (taken 1960s–1988), and ending with a 2007 decision to delegate authority for Pak Mun's annual four-month opening to a provincial-level multi-stakeholder committee. Decision making since the early 1990s followed distinctive pathways which link robust processes such as framing, mobilization, repression, feedback (escalation), elite intervention, negotiation, and decision. These processes constitute political drivers in water allocation decision making. Although causally linked to each other, these drivers often required the presence of contingent events and processes to initiate them. Such events and processes included violence, media decisions to cover events, as well as events beyond the control of most actors (such as political instability in successive governments). The pathways and processes (drivers) model of decision making requires contextualization. Pak Mun analysis is set in the context of Thai democratization, accompanied by analysis of specific constraining institutions, such as power system planning, and state conflict management processes.

2. Introduction

Pak Mun Dam has been the subject of two decades of contentious decision making around its benefits and impacts. What lessons does the case offer about political drivers of success in decision making related to water allocation?

The analysis presented here covers a series of 14 decisions, beginning with decisions to design and propose a particular kind of dam (taken 1960s–1988), and ending with a 2007 decision to delegate authority for Pak Mun's annual four-month opening to a provincial-level multi-stakeholder committee.

The paper shows that decision making since the early 1990s followed distinctive patterns ("pathways") which link robust processes such as framing, mobilization, repression, feedback (escalation), elite intervention, negotiation, and decision. These processes constitute important political drivers in water allocation decision making.

Although causally linked to each other, these drivers often required the presence of contingent events and processes to initiate them. Such events and processes included violence, media decisions to cover events, as well as events beyond the control of most actors (such as political instability in successive governments).

The pathways and processes (drivers) model of decision making is set in the context of Thai democratization, accompanied by analysis of specific constraining institutions, such as power system planning, and state conflict management processes.

The analysis draws on the author's Ph.D. thesis (Foran 2006) and on subsequent analysis (Foran 2007; Foran and Manorom 2009). Based on literature reviewed for this project (Mansbridge 2009; Naurin 2007), the conceptualization of "deliberation" as a social mechanism (driver) has been refined. The author has also identified additional relevant process and tools not in the PN67 inception report.

2.1 Location

Pak Mun Dam is located approximately 80 km downstream from the provincial centre of Ubon Ratchathani and 5.5 km upstream of the confluence of the Mun and the Mekong (see Figure 1). Constructed during 1990–94, the dam is 17m high, 300m wide, with eight radial gates that can be fully opened to release water.

The Mun's living aquatic resources are noted for their high biodiversity and contribution to subsistence and trade (Roberts 1993; Srettachau 2002). When the gates of Pak Mun were opened in 2001–02 for a year-long experiment, two studies counted more than 150 species of fish (Srettachau 2002; (Ubon Ratchatani University [UBU] 2002). Fishermen use a variety of gear, including hook and line, traps, nets, and beach-haul seines. Total catch has not been estimated for a number of reasons, including the large number of landing sites, subsistence consumption, and—most importantly for sustaining important fish populations—lack of a long-term fisheries assessment program. A concrete fish ladder was installed in 1996 but its design does not allow significant upstream migration (Roberts 2001). Instead, in a 2003 decision we explore below, EGAT was requested to fully open the dam's gates during the annual wet season, nominally for four months beginning June.

Villagers in the lower Mun River basin purse similar livelihood strategies. They are smallholder farmers who grow one main crop of rice during the May-October monsoon. Holdings are typically 5-7 ha, but soils near the dam are often poor. By Thai standards many households are income poor. Almost all households supplement their income by off-farm labour, with significant rates of seasonal and long-term out-migration, especially among younger people (UBU, 2002).

The degree to which local people derive benefit from living aquatic resources, especially wild fisheries, has been a topic of multiple rounds of dispute. Although marginalized in state-sponsored livelihood surveys, and difficult to quantify because diffuse, variable, and politicized, living aquatic resources make meaningful contributions to livelihoods (Srettachau, 2002; UBU, 2002; Foran, 2006, ch. 8). This is especially true for land-poor farmers.

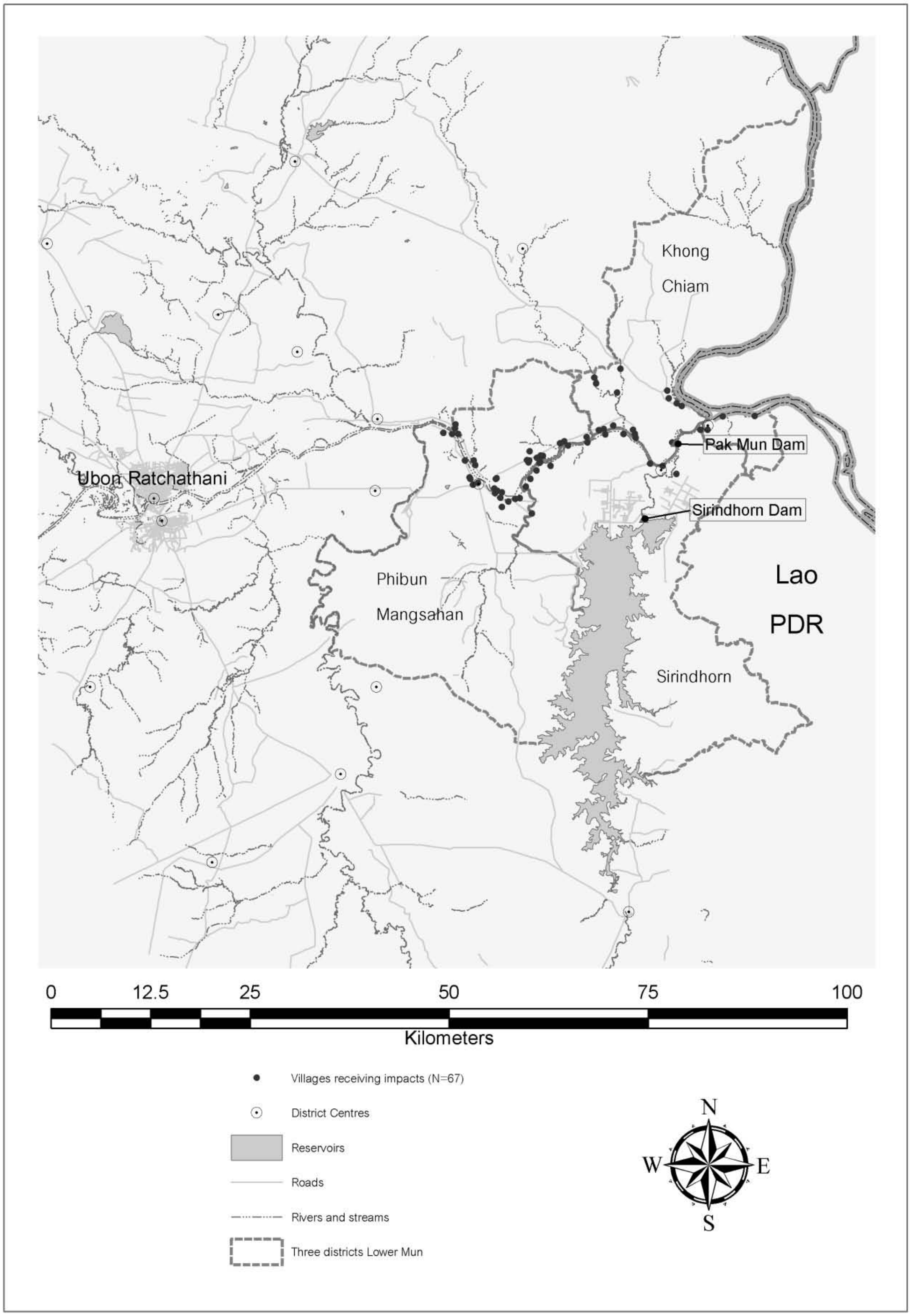
Because it is a "run-of-river" dam operated for power generation, Pak Mun cannot also be used to store significant amounts of water. Yet since the early 2000s—partly as a result of populist development policy—the state has expanded small pumped irrigation systems near and upstream from the dam.

3. Focal water allocation issues

The focal issue could be summarized as *how to define and obtain a socially-optimum set of goods and services from the Mun river*, focusing on goods such as hydropower, irrigation, and living aquatic resources.

The reason for selection as a PN67 case study is that Pak Mun is a well-documented case consisting of both incremental and milestone-setting allocation decisions since the early 1980s.

Figure 1 Lower Mun Basin and Pak Mun Dam


Khong
Chiam
Pak Mun Dam
Ubon Ratchathani
Sirindhorn Dam
Lao
PDR
Phibun
Mangsahan
Sirindhorn
0
12.5
25
50
75
100
Kilometers
Villages receiving impacts (N=67)
District Centres
Reservoirs
Roads
Rivers and streams
Three districts Lower Mun
N
W
E
S

6

Source: Foran and Manorom (2009)

3.1 Key decisions and initiatives

Table 1 summarizes a number of key decisions and initiatives, each of which is discussed in more detail below.

Table 1 Pak Mun Dam, key decisions and initiatives

Date	Decision or initiative
1960s–1988	To design and propose a particular kind of dam
1989	To approve Pak Mun Dam
1991	To establish an MSP to handle dam opponents' claims (Niyom committee)
1993	To set up an MSP to handle a broad range of dam impacts
1993–94	To compensate for a wider set of dam impacts (1993–Feb 1994)
1995	To compensate eligible households for loss of fisheries income during 3-yr construction period
1997	To compensate eligible households for perpetual loss of fisheries income
1998	To reverse the 1997 decision on fisheries compensation
1999	Assembly of the Poor campaign for dam decommissioning
1998	To allow World Commission on Dams to do a case study
2001	To allow an experimental dam opening and multi-disciplinary studies
2002	To open Pak Mun Dam four months a year
2003	To provide a livelihood restoration package
2007	To delegate annual opening to provincial multi-stakeholder committee

Sources: Foran (2006); Foran and Manorom (2009)

3.2 Key actors

State actors

Major decisions by authorities were largely confined to the executive branch (not the legislature or judiciary) and taken at the national level. Within the executive branch, EGAT was the main project sponsor. Key decisions were made or ratified by Cabinet resolution.

Occasionally, authority to negotiate with civil society actors was devolved to inter-agency committees that met in Ubon Ratchathani province or in Bangkok. Aside from state-led decisions to propose, design, and approve the dam, all decisions in Table 1 were responses to claims presented by civil society actors. The importance of NGO and villager actors cannot be overstated.

NGO and community-based actors: resistors and supporters

Resistance against Pak Mun began in 1989–90 with informal networking among villagers who opposed the dam and the state's process. To promote the project, the state worked through local authorities such as district and sub-district officers and village headmen. Prior to construction, they tried to elicit public support at meetings they summoned. The state's paternalistic process and threats of repression failed to intimidate a few articulate and confident middle-aged women. They helped form a larger network and sought advice from a small civil liberties NGO in Ubon Ratchathani (Missingham 2003). Opposition spread to town people: first to vendors opposed to flooding of Kaeng Saphue, a large rapids and tourist attraction. Later it spread to a segment of the middle class in Ubon Ratchathani.

In the earliest stages people seemed to be responding to lack of information and fear of widespread impacts. When it became understood that the run-of-river design chosen by EGAT would lead to a much smaller area inundated, and when EGAT undertook not to flood Kaeng Saphue, most of the opposition dissipated. The protest campaign narrowed to a core of villagers and alternative development NGOs.

However, local people were among the first to raise the concern that Pak Mun dam would destroy wild fisheries harvests, after they witnessed blasting of the river bed during construction in 1991. By 1994, the Mun River Villagers Committee for Rehabilitation of Life and Community, a villagers' organization representing some 2,500 families from more than 50 villages had formed to press for compensation in terms of land and fisheries.

By late 1995, villagers and NGOs campaigning against Pak Mun helped create the Assembly of the Poor (AOP), a national alliance to represent livelihood-insecure farmers and urban workers. Between 1995–2002, the AOP engaged in a number of direct actions (civil disobedience campaigns) around proposed or completed infrastructure projects, including Pak Mun.

By 1994, led by village headmen and other local authorities, a network in *support* of Pak Mun dam also emerged. Lacking a broad change agenda, its primary objective was to dissuade villagers from joining anti-dam action. The Kamnan and Village Headmen's Group (KVHG) promised equal compensation to people, without need to protest. In 2008, Pak Mun's fifteenth year of operations, pro- and anti-dam coalitions still existed.

International actors

In addition to its longstanding role articulating Thai post-WWII development policy, the World Bank has been a significant lender to Thai energy projects, though not always the majority financier. Associated with Bank project review are channels for foreign donor and transnational advocacy (Fox and Brown 1998).

Knowledge brokers

Environmental and social impacts of a large dam are topics where active debate over what constitutes "the facts" forms an important locus of contention itself. Not surprisingly, knowledge brokers (those with claims and resources to produce knowledge about a range of dam-related issues) also played important roles at various points in episodes of contention. But as we shall see, far from rising above contention, knowledge produced by expert individuals and organizations was politicized. The case thus offers insights into the relations between politics and knowledge.

3.3 Review of key decisions and initiatives

Decisions to design and propose a particular kind of dam (1960s–1988)

The hydropower potential of the lower Mun river was known in the late 1960s, as a result of investigations carried out by the French firm SOGREAH, which proposed a dam located at Kaeng Tana rapids upstream of the confluence of the Mun and the Mekong. EGAT began to re-examine the feasibility of a hydropower dam in the late 1970s, and introduced Pak Mun into its least-cost power system expansion plan (Power Development Plan) in 1981 (Amornsakchai et al. 2000) [Table 3.1]

A January 1982 EIA commissioned by EGAT (conducted by TEAM consulting engineers) was for a dam with a crest at 112m above mean sea level (a.m.s.l.). If located at Kaeng Tana rapids, 4000 households would have needed resettlement. This number appears to have been unacceptably high, in light of EGAT's unsuccessful experience proposing Nam Choan dam during 1980s, which allegedly would have impacted about 2000 Karen villagers in western Thailand (Foran 2006: 116).

By 1985, EGAT had decided to approve a lower water retention level (108m a.m.s.l.) and relocated the dam site upstream to its current location at Ban Hua Haew village. This decision accommodates a 1983 decision by the government to turn the area around Kaeng Tana into a national park. Pak Mun's run-of-river, low-head design was the first proposed for a large dam in Thailand. The design is a response to hydrological conditions of the lower Mun the relatively low gradient of the river causes Mekong flood waters to back upstream into the Mun during the main (southwest) monsoon. By 1987, Pak Mun had re-appeared in EGAT's Power Development Plan.

Decision to approve Pak Mun Dam (1989)

Pak Mun Dam was first approved by the Cabinet of PM Chatichai Choonhavan in April 1989. The immediate political context in which the Chatichai regime emerged helps explain the general orientation of the executive branch towards infrastructure projects such as Pak Mun. Since the mid-1980s, the Thai economy had grown, following its shift from import-substitution to an export-oriented strategy (Bello, Cunningham, and Poh 1998; Phongpaichit and Baker 1995).

EGAT presented the project to Cabinet a total of four times. Two of the four were for pro-forma approvals, while the other two involved substantive budget authorizations.

Pro-Forma

April 1989, for approval “in principle”

February 1991, approval of construction

Substantive

May 1990, approval of budget

September 1991, approval of increased budget

The Cabinet understood that the 136 MW Dam would double the installed generation capacity in the Northeast region, a region dependent on power imports, with peak demand growing at double digit rates. In addition to being part of a least-cost system expansion plan, Pak Mun had an expected internal rate of return of more than 18%, and would also produce irrigation and fisheries benefits (EGAT 1988; NESDB 1990).

National Economic and Social Development Board (NESDB) approval was required before approval by the Budget Office. The development board submitted an 18-page, highly favourable memorandum in support of the project to Prime Minister Chatichai prior to the May 1990 approval (National Economic and Social Development Board [NESDB] 1990). Basic data were taken from EGAT (EGAT 1988). No sensitivity analyses are included in the report. The basis of NESDB's approval appears to have been EGAT's 1988 Summary Report, which presented a high positive internal rate of return, as well as NESDB's decision to authorize an environmental mitigation plan (NESDB 1990; EGAT 1988).

The National Environmental Board is an inter-agency panel that could have played a more active role in Pak Mun Dam's approval, but did not. Under environmental law at the time, the NEB received, and presumably reviewed, EGAT's EIAs. Interestingly, it commented in the case of other dams proposed during the same period, such as Kaeng Krung dam, but not in the case of Pak Mun Dam (Siriyuvasak 1994). One possible reason is that Kaeng Krung attracted more intense opposition than Pak Mun at that time (Chaidet, interview 14/2/06).

The National Energy Policy Office (NEPO) was another potential reviewer of proposed power stations. NEPO was formed in 1986, prior to Pak Mun Dam's approval. It would later establish a reputation for itself as a more critical energy policy agency than NESDB (see Foran 2006: chapter 5). However Dr. Wanchai, a former NEPO analyst, stated that NEPO was not involved in reviewing options to Pak Mun (interview, 20/10/04). According to Dr. Wanchai, had demand-side management (DSM) alternatives been implemented more vigorously, Pak Mun Dam might not been approved, because of its high cost. Dr. Wanchai mentioned other proposed hydro-dams such as Mae Lama Luang that were in EGAT's PDPs, but never built because energy conservation analysis suggested cheaper alternatives. Pak Mun was approved and construction began well before International Institute for Energy Conservation (an international technical NGO) released a DSM plan for Thailand in November 1991 (Foran 2006: ch. 5).

Other branches of the state played a limited role in the early review of Pak Mun. Individual MPs in Ubon played a role in oppositional and support networks, but did so in their traditional capacity as individual patrons, as opposed to representatives of political parties with explicit policy positions regarding the dam. Among northeastern MPs, Pak Mun was almost universally popular. The proposed Kaeng Krung dam, by contrast, divided politicians over allegations southern MPs would gain from logging the inundated area (Siriyuvasak 1994: 34). In neither case did the legislature set up a hearing process to deliberate the projects prior to executive branch approval.

Decision to establish an MSP to handle dam opponents' claims (Niyom committee, 1991)

Background

Construction at the dam site began in mid-1990, shortly after budget approval in May 1990. The Chatichai government set up a Committee for the Compensation of Land Rights and Properties and a Committee for Resettlement. The total number of affected households understood to be affected was 262 households, a number that deviated only slightly from the 243 households identified in the EIAs conducted in the 1980s.

In 1990, after a year of sporadic demonstrations, the long rallies that would become emblematic of Pak Mun emerged. These multi-day and multi-week gatherings mark the intensification of protest. They reveal the development of collective action using tactics much more disruptive than an afternoon or a day protest. Initially, the transgressive[1] nature of their tactics triggered strong defensive moves by dam supporters. When opponents staged a three-day sit-in outside provincial hall, they were met by pro-dam villagers organized Ubon MP Chaisiri, an MP in the Chatichai government.

As construction got under way, notwithstanding police repression and harassment by project supporters, protests increased. Opponents continued to press for a halt to construction pending a more transparent process of inquiry and deliberation.

A two-week rally that began in May 1991 near the construction site and ended up in Bangkok is worth reviewing on several counts. The interaction between villagers, bystanders (both opponents and supporters of the dam), and state agents took a form of a drama (unfolding in both time and space) that would repeat itself literally dozens of times over the next decade. The rally also lead to the first concessions the emergent movement won from the state.

The rally began on 21 May 1991, three weeks after villagers formed *Klum hak mae nam mun* (Love the Mun River Group) with representatives from 20 villages in Khong Chiam and Phibun Mangsahan districts (Hubbel 1992: 67). The rally occurred three months after the NPKC coup ousted the Chatichai government and installed PM Anand Panyarachun.

Villagers gathered to protest the demolition of a wooden spirit house they had erected at the construction site a year earlier. Such spirit houses are revered in Thai culture as guardians of place. Erecting the spirit house, wittingly or not, was an effective frame for collective action. It invoked spiritual guardianship of the river. When a foreign construction worker bulldozed the shrine to make way for

[1] A transgressive situation is one interpreted by contending parties as one of dynamic threat/opportunity, where parties view the political context as uncertain enough to demand innovative action/reaction (McAdam et al. 2001).

construction, it signalled a violation against which villagers could rally to defend and re-assert themselves.

Some 800 villagers reinstated the shrine, and continued to demonstrate nearby for EGAT to release accurate information about areas that would be flooded. They demanded the government set up a four-part committee to review the information and other impacts (*Nation* 1991a). Four days later, police and army troops set up a roadblock to prevent additional supplies and people from reaching the demonstrators. Students who were rallying with them held a press conference in support of the villagers, and appealed to the Prime Minister to halt the construction pending an independent inquiry. Almost two weeks later, after being harassed at night by ten men throwing manure and stones, and firing shots, the demonstrators attempted to march towards the dam site, but were prevented from doing so by police (AOP 2002)[2]. They dispatched a delegation of 150 villagers to protest outside Government House in Bangkok, and six representatives were finally received by Dr. Niyom Visaithip, Minister in the Prime Minister's Office responsible for EGAT, on 4 June 1991.

Formation of MSP (Minister Niyom's committee)

Dr. Niyom assented to demands to appoint a committee composed of four parties: government, villagers, academics, and EGAT. Disagreement immediately sparked over the mandate of the committee. Its official mandate was to oversee compensation and resettlement, to verify the number of families to be resettled, and to verify the accuracy of EGAT's flood zone surveying. Villagers however wanted to committee to do much more: to examine the entire social and environmental impacts of the dam and recommend that Cabinet revoke approval if impacts exceeded a certain threshold.

But what was that threshold? That was the crucial question facing Niyom as the nominal decision maker. EGAT claimed less than 300 households would be affected; opponents claimed more than 3,400 households would. Niyom declared that if the number of (verified) affected households exceeded 1000, the government would review Pak Mun (AOP Chronology, 4 June 1991). The cabinet gave Niyom's committee less than two months to verify affected numbers (Usher 1991c).

Reflections of a state decision maker

Dr. Niyom later recalled the constraints he operated under (interview 21 October 2004). The project had already been approved; it had already gone out for tender; the contractor had already begun construction. Opponents were already marching against it. They wanted him to guarantee that he would cancel the project if the

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[2] See AOP 2002 (henceafter "AOP Chronology"), entry for 3 June 1991.

work of his committee led to that conclusion. He allowed six villagers to serve on one of the two committees he set up. They wanted more.

The problem was that the various advocates, almost all of them, did not understand the complexity of the objective function. What they understood was what they wanted, which was one objective. They did not understand the set of constraints, or else set these constraints to zero. They could not compromise. Advocates opposing the dam had only one solution, which was that the dam must stop. EGAT had only one solution, that the dam must be built. The prior constraints were that the government had already signed off on the construction contract. Now, the government is an institution, not a group of individuals. When governments change, and new people enter office, the opponents think that they can exercise significant agency [to change policy]. We asked, first, whether it was possible legally to cancel the project? The answer was yes, if there was evidence of corruption. We thought there was, but did not have evidence. Second, politically, was it evident that it would create very severe losses? But [the project] was complex, it wasn't clearly obvious that it would be a disaster for the country . . . . If you ask whether the project should have been built, the answer is, "it's not worth it" (Niyom, 21/10/04).

Dr. Niyom indicated that privately, that was how he felt at the time, but again referred to the "constraints" he felt he and the Anand government were under. “In the end, rationally, it was not possible to do anything,” he said. There are several points worth making about Dr. Niyom’s decision-making. First, his model of public decision-making, is the solving of a complex objective function based on a set of constraints. While the decision maker attempts to optimize, in practice in situations such as Pak Mun it is only possible to satisfice, because "the data are not sufficient and our knowledge is not sufficient."

Next, when Dr. Niyom said that “rationally, it was not possible to do anything” he meant that it was not possible, given the model of positivist, rational, decision-making that he operated with, to make the kind of non-incremental changes the opponents of the dam were hoping for. By implication, the best one could do was “muddle through,” the term Charles Lindblom famously used to describe and defend limited, as opposed to comprehensive, rational analysis (Lindblom 1959; Parsons 1995)[3].

Third, Dr. Niyom’s account of his predicament displays a familiar justification, one based on economic burdens borne by the state: a contract was already signed, and construction had already begun. These were sunk costs with clear financial commitments, against which no clear evidence existed that the dam would bring a disaster upon the country. By implication, the costs of switching course on a project with such presence and momentum would be felt by the state in one symbolically

[3]Parsons pp284–285

huge impact if it cancelled. On the other hand, the cost of providing additional compensation for disaffected villagers appeared to be less in magnitude and symbolically slighter. (Wodak and Meyer 2001)[4] describes the standard argumentative device in Niyom's justification as follows: "if a person, an institution or a country is burdened by specific problems, one should act in order to diminish [those] burdens," which in this case were financial and symbolic.

Dr. Niyom's committee overran its original time frame and appears to have ended in dispute over due process (Traisawasdichai 1991). By mid-October 1991, while World Bank directors and representatives visited Ubon, Dr. Niyom was speaking out in public as a full-fledged advocate of the project, as was the Thai Finance Minister (Tangwisuttijit 1991). Meanwhile, some of his committee members were still going about their work. Did the efforts of the villagers then amount to little, or even backfire?

That is certainly one reading of events. However his multi-stakeholder process produced at least one unanticipated result. The committee found that the total number of affected households was 903. This number included 655 newly-recognized households whose land would be flooded.

The fact that different categories of affected households existed was a cause for significant confusion. At times, it seemed as if EGAT chose, in media releases, to discuss only the limited category of households with flooded structures (Table 2, Set 1 below) leaving other parties to disclose the larger set of affected households. Niyom censured EGAT for not disclosing all its information from the onset of the project (AOP Chronology, 13 October 1991).

To be sure, such an outcome was miniscule compared to the momentum of the project. Yet they are significant for our purposes because they are examples of policy-relevant concessions made by the state in response to discursive civil society actions. Had there been no independent review of the number of affected households, EGAT would not have unilaterally compensated any more than the number it originally identified.

Table 2 Categories of households recognized for compensation of structures and fixed assets

Set (1) Recognized in 1982–83 studies by Team Consulting Engineers Ltd.	Number
1.1 Affected by construction, Ban Hua Haew village	11

[4] (2001: 76)

1.2 Living below 108m a.m.s.l.	136
1.3 Living 108–108.5m a.m.s.l.	96
sub-total	243
Set (2) Recognized in 1994 by civil society campaigns, 1990–94	
2.1 Affected by river bed blasting	227
2.2 Agriculture land inundated	706
2.3 Living above 108.5m a.m.s.l., chose to relocate	473
sub-total	1406
Total	1649

Source: Amornsakchai et al, 2000, p58. Notes: Non-fisheries impacts only. ‘Recognized’ refers to recognition of *categories*; numerical estimates vary. Original set (1) estimates ranged from 241–379. A total of 1821 households received compensation (Missingham, 2003, p72).

Next, although substantive outcomes of Niyom’s four-party process did not amount to much, consider its indirect impacts. First, the committee gave substance to the notion of independent review. This was exactly what the dam opponents were calling for, when lobbying the World Bank in 1991 to reflect more critically on its role as a potential funder of the project. Second, villagers and other opponents developed the “extended shifting rally” as a form of contention they were able to use in many of their subsequent protests. Third, multi-stakeholder processes continued to be demanded by opponents.

Initiative to set up an MSP to handle a broad range of dam impacts (1993)

Background

The new campaign for accountability began on 27 February 1993 when a hundred villagers activists, now in the name of the *Khanakamakan chao-ban phuea fuenfu chiwit lae chumchon lum nam mun* (Mun River Villagers Committee for Rehabilitation of Life and Community) travelled to various villages along the left bank of the Mun, urging villagers to join their campaign for the government to sign a memorandum of understanding (MOU), which would commit it to take responsibility for important impacts from the dam. By March 2, activists had prepared a list of demands they wanted Prime Minister Chuan Leekpai’s government to consider in the MOU.

The activists’ demands covered the known and likely impacts of the project, as framed by opponents:

(1) Mapping and Surveying; Timely Notification. For EGAT to release maps and declare the precise location of the 108 meter AMSL elevation to the public and to affected people within 30 days;

(2) Compensation. For EGAT to pay compensation for loss of fixed assets including land, structures, trees which have been flooded, as determined under (1), as well as the cost of resettlement;

(3) Compensation. For affected households that need to resettle: for EGAT to build housing, and provide land including household plots and rice paddy or other cropland

in appropriate areas with water supply, close to the original location; if this is not possible EGAT is to pay compensation at fair value for land loss to flooding (but not to exceed 10 rai);

(4) Fisheries. To establish a committee composed of villager representatives, the Department of Fisheries, academics nominated by villagers, and EGAT representatives, to study and survey impacts on fishing occupations during a period of project construction in the project area (from Kaeng Tana to Kaeng Saphue), to determine principles and methods of providing assistance and compensating affected individuals;

(5) Schistosomiasis. In the event schistosomiasis infections occur after construction of the dam, for EGAT to pay for medical expenses as well as expenses in solving public health problems;

(6) Dispute mediation. In event that parties to the memorandum are not satisfied with the value established for various losses under items (2) to (5), for the party disputing the value to refer the matter to a mediator and for the results of that mediation to be binding.

(Abridged from: Working Group to Monitor Impacts of Pak Mun Dam 1993: 31–32)

The call for unambiguous mapping and timely notification indicates that opponents were still not satisfied, almost three years after construction began, with their knowledge of the scope of direct flooding impacts, to say nothing of ecological impacts.

Bargaining over impacts and appropriate conflict resolution process (Akhom committee)

Negotiations over the draft memorandum of understanding finally began in Bangkok on 11 March 1993. This was after several days of pressure, including an emergency meeting of student organizations nationwide, teach-ins, and a three-day vigil on the streets outside Government House, maintained by a core group of 20 activist students. EGAT would not commit to opponents' proposed language. It objected to a clause for disputes to be resolved by an independent mediator. Meetings and negotiations took place on three of the five following days. Then on 18 March, in a meeting lasted almost ten hours, government representatives adopted all clauses of the opponents' proposal, with the exception of the clause on mediation. Protesters argued that this was the most important clause, since it was the mechanism by which they could hold EGAT and the government accountable. The state however refused to budge, claiming that EGAT's legal charter did not recognize mediation (WG-PMD 1993).

The senior-most official signing the memorandum was MP Akhom Engchuan, Deputy Permanent Secretary for Political Affairs in the Office of the Prime Minister. It was also signed by Apichart Triisawatichai, Secretary to Sawit Phowihok, the Minister responsible for EGAT under the Chuan government (Niyom's successor).

The 18 March 1993 agreement added language setting up a new four-party committee with various specific powers, including to advise agencies on the implementation of the agreement; to receive and assess peoples' grievances; and to refer grievances to relevant agencies for action within a time frame specified by the committee (ibid., 70).

Despite the missing clause on mediation, the agreement was a tangible step forward toward holding the state accountable for the project. However, by the end of the second implementation meeting in late March, it was clear that EGAT and the villagers could not agree over the selection of an outside, permanent chairperson. The oppositional network criticized EGAT's nominees as having close ties to the utility. They also complained that EGAT's rejection of their own nominees was unjustified.

By the second meeting on March 30, Akhom had apparently secured the EGAT Governor's agreement to the committee chair (AOP Chronology, 30 March 1993). Dam proponents raised other issues. A group of pro-dam villagers petitioned the committee, asking that they be permitted to join it. Minister Sawit advised Akhom that he favored nine kamnan (sub-district officers) to represent all villagers. Committee members from EGAT questioned the legitimacy of protestors' representatives.

Akhom, the temporary chairperson, declared at the end of the second meeting that he had reached the limit of his mandate, and referred the matter to Minister Sawit. Within a week, 1,000 protestors gathered in a traditional community spirit ceremony (*bai si su khwan*) to support their representatives (ibid., 6 April 1993). However within a month of the 18 March 1993 agreement, Minister Sawit dealt the dam opponents a stunning reversal of fortune when he flatly declined to continue the work of the committee, saying he had not "signed any agreement with anyone" (Buchita 1997)[5].

Notable parallels exist between the 1991 dam opponents' campaign for transparency and deliberation reviewed above, and their 1993 campaign to hold the state accountable for dam impacts (see discussion of MSPs in Section 4.4 below).

Contentious interaction resulting in state decisions to compensate for a wider set of dam impacts (1993–Feb 1994)

Missingham (2003: 85) argues that the 18 March 1993 agreement "came to nothing" because Sawit terminated it the following month. If we look more closely at the events that followed, however, we find that by October 1993, Minister Sawit had announced the formation of a committee headed by the Ubon Governor Maitree Naiyakul.

Maitree's committee set up sixteen sub-committees to handle various grievances. If the bad news for dam opponents was that there was no villager participation, the good news was that the government had devolved (or so it claimed) a good deal of responsibility for handling resettlement and compensation down to an appropriate level of government. Among the sub-committees formed were those tasked to assess

[5] p 62

impacts on households (by registering complaints), to calculate compensation, and to pay it. There was also, importantly, a sub-committee to survey and study impacts on fishers.

By December 1993, the state had also apparently accepted demands for a process devolved down to a set of village-level committees, with villager participation, to process residents' compensation claims. This was a vast improvement over a process marred by several years of widespread mistrust over EGAT's information base. While a devolved process helped deliver just compensation, it was not sufficient as long as project opponents were unable to hold the state accountable for specific categories of impact.

The state and protestors were particularly in dispute over land above 108m a.m.s.l.. EGAT initially claimed that it would pay only for earthworks to raise affected structures. Opponents objected that their homes would be surrounded by water, and after more demonstrations, prevailed in getting the state to pay the costs of moving and re-erecting those houses. It took another very risky series of direct actions to force the government to accede to this claim: in late 1993, villagers sporadically disrupted detonation work on the river bed. EGAT's contractor responded by continuing the work, albeit covering up some of the blasting with netting. It told protestors if anyone was killed, EGAT was prepared to pay out compensation, which would not exceed 30,000 baht per person. The state finally acceded in February 1994.

To summarize the campaigns of 1993: by April, the state was initially successful in thwarting villagers' goal of direct high-level participation in problem-solving (MP Akhom's short-lived process). Protestors nonetheless campaigned to broaden the limited concessions offered. They achieved recognition of the need to take concrete steps to address agendas they consistently advanced. In this respect their collective action and their discursive framings had indeed influenced the state's response, as measured by the Maitree process and its tacit acceptance of protestors' frames for problem resolution.

By February 1994, after staging more sit-in protests aimed at obstructing construction, anti-Dam villagers were able to negotiate agreements regarding remaining resettlement and land-based asset compensation cases to their satisfaction (Buchita 1997; Amornsakchai et al. 2000: 74). The government of PM Chuan Leekpai (first term) agreed to recognize a total of 1649 households (see Table 2). These decisions reflect outcomes negotiated with anti-dam organizations, in the context of sustained political pressure.

Decision to compensate for loss of fisheries income during 3-yr construction period (1995)

Background: bargaining over fisheries compensation

In early 1994, as the dam neared its June commissioning, dam opponents organized a new round of collective action emerged around a discourse to hold the state explicitly accountable for impacts on fisheries. Those impacts had been argued about since 1991, but were only beginning to be processed by Gov. Maitree's fisheries subcommittee two years later. In late 1993, dam opponents demanded that the state pay fisheries compensation of 105,000 baht [$US1400] per household, or 35,000 baht for each year of the three-year construction (Buchita, 1997; Foran, 2006, p197). Dam opponents argued that this amount, approximately 100 baht/day, was a conservative estimate of the average daily value of a fishing household's catch.

In April 1994, there had not been a concrete offer regarding compensation from Governor Maitree's fisheries sub-committee. To pressure the government, activist villagers staged another two-week long dry-season demonstration in Bangkok, calling for Minister Sawit to assume responsibility.

Prime Minister Chuan declared that Bangkok-based officials had no authority to deal with their claims – Governor Maitree was handling them. Chuan did promise to request that Maitree's committee meet again soon. However, at its next meeting on 6 May 1994, Maitree's committee expressed the view that acceding to the villagers would invite a never-ending series of compensation claims (Buchita 1997: 69.) By June 1994, however, Maitree's committee proposed to pay fisheries compensation on a graduated basis. Fishermen living nearest the dam would get up to 90,000 baht, while those living in the most distant zone, around Kaeng Saphue upstream, would get only 15 baht.

In October 1994, at the beginning of the post-monsoon dry season, these offers and the distributional tensions they embodied were the immediate context in which the Mun River Villagers' Committee (MRVC), the organization at the centre of the oppositional network, launched a fresh campaign. Calling on the state to compensate for three years' lost fisheries income was the centrepiece of this campaign.

Marathon demonstration

On 18 October 1994, about 2,000 villagers gathered at Ubon provincial hall to press their claims for the 105,000 baht compensation. In addition they demanded:

- Ten *rai* [1.6 hectares] of land per household for landless fishermen [a minority of the demonstrators];
- Changes to the "unjust" eligibility criteria for compensation;
- Termination of the existing fisheries sub-committee in favour of a new committee half-comprised of their representatives, with a clear and decisive problem-solving mandate.

(AOP Chronology, 14 October 1994)

On the tenth day of their rally in the grounds of the Ubon provincial hall, villagers joined negotiations resulting in a lump-sum offer of 10,000 baht. The 500 protesters still demonstrating considered this amount unacceptably low, and announced a march to the dam almost 80 kilometres away. A plan had been formed by that time to demonstrate as close to the dam wall as possible. When the protesters finally reached the vicinity of the dam, they issued an ultimatum to the government to address their demands or otherwise face "decisive action." After waiting three days without any response, they walked a final eight kilometres into the dam site, cut through a barbed wire fence, and staged their demonstration right beside a final barricade EGAT had set up. The protesters settled in for a long demonstration, set up meeting spaces and a classroom for children, and began to work on marketable handicrafts in their spare time (AOP Chronology, 12 December 1994; Missingham 2003: 90). Several weeks later, a contingent of about 300 villagers seeking compensation over impacts from nearby Sirindhorn Dam (completed 1971) joined them.

Elite intervention

A variety of third parties sympathetic to anti-Dam villagers attempted to intervene in the conflict. Nine days after the rally began, a delegation from the Students Federation of Thailand met with the Prime Minister. They criticized Sawit, the EGAT Minister, for going overseas on holidays and not taking responsibility. They appealed for Prime Minister Chuan to take courage in resolving the problem. Chuan responded by summoning EGAT senior management to meet with him. He referred again to the Governor's problem-solving committee and chided unspecified “senior people” (*phu yai*) in EGAT for “not paying as much attention to the matter as they should” (AOP Chronology, 22 October 1994).

Two weeks after the rally began, the House of Representatives Committee on Justice and Human Rights also intervened, responding to protesters’ appeals on the fairness of the “nine baht a day" compensation payment. Chairman Nipon Visithyuthasat noted the Committee’s prior site visit (in 1993) and recommendations submitted to the government. Nipon said he “did not understand what the government was doing in letting the problem drag on until today” (ibid., 28 October 1994). A few days later, the Committee criticized the state's compensation proposal, and undertook to submit its proposals directly to PM Chuan, bypassing Minister Sawit, whom it noted had declined several invitations to appear before it (ibid., 3 November 1994).

Academics also intervened. On 1 December, during a well-attended seminar at Chulalongkorn University, a number of academics criticized the state's social and environmental impact assessments. AT that event Minister Sawit announced a "long-term compensation fund” (ibid., 1 December 1994). Academics also met privately with Sawit to urge the formation of a new committee process with villager participation.

Formation of MSP (Plodprasop committee)

In late January 1995, the government announced the formation of a new Committee on Assistance and Occupational Development for Fisher-Farmers (CAODFF), in which villagers and academic representatives would also participate, to be managed by consensus. Dr. Plodprasop Surasawadi, Director of the Department of Fisheries (DOF), chaired the committee. By this time, Korn Tapparangsri, leader of Chart Pattana, one of Chuan’s coalition partners, had replaced Sawit as Minister responsible for EGAT.

Almost eight weeks later, the new committee and the new Minister reached an agreement with villagers to pay 90,000 baht, almost all of the compensation originally demanded; and the rally dispersed. As part of this agreement, the Chuan government agreed that if the fisheries stocking program and fish ladder (completed in 1994) did not restore fisheries livelihoods, it would provide 10 rai of land (or cash equivalent) to eligible households.

Analysis

On their side the protesters had sympathetic allies, tolerance of their non-violent protest, divided elites, and early concessions made by their opponents (see Foran 2006: ch. 7). They also had large numbers and media interest, particularly at the beginning of rallies, counter-rallies, and other dramatic points in the 157-day protest, such as their occupation of the left side of the dam (*Thai Rath* 1994).

The above factors weighed in their favour, sustaining mobilization, but were not sufficient to win a final compensation settlement of 90,000 baht. What appears to have tipped the scales in their balance was firstly PM Chuan's replacement of Sawit (a fellow Democrat) by Korn. As the new Minister responsible for EGAT, Korn moved decisively in January to re-open secret negotiations with the Mun river demonstrators, bypassing Governor Nithisak's committee altogether (*Phuchatkan Rai Wan* 1994). The press interpreted Korn's more participatory style as an implicit challenge to the Democrats' model of devolved conflict management (*Krungthep Thurakit* 1995).

The second factor was Korn's acceptance of activists' demands for a new consensus-based, multi-stakeholdercommittee. The new committee featured academics such as Somkiat Pongphaiboon and Dr. Bantorn Orndam, both seasoned social activists and articulate allies of villagers' movements.

A third factor securing a favourable fisheries settlement was action taken by Dr. Plodprasop Suraswadi. Plodprasop chaired the new negotiating committee[91] approved by Minister Korn. As head of the Thai Department of Fisheries (1989–97) he found himself in conflict with EGAT in 1992, after a large industrial spill occurred upstream in the Chi river, resulting in large fish kills. DOF wanted EGAT to halt construction of Pak Mun Dam, so that fish from the Mekong could re-populate the Chi unimpeded (Roberts 1993: 122). While EGAT was building Pak Mun, Plodprasop spoke out "unequivocally" against the Dam and its fisheries impacts (ibid., 106).

Plodprasop had made a brilliant career, obtaining a Ph.D. in Ecology at the University of Manitoba on a Thai government scholarship, subsequently returning to DOF and rising to head the agency at age 44. It is plausible that, as an ambitious civil servant, he wanted to deliver results for the Pak Mun villagers in order to further his own career. Plodprasop's committee, the CAODFF, resolved after its first meeting to recommend a 90,000 baht compensation payment for eligible fishers.

Plodprasop declared to waiting villagers, "I give you a gentleman's promise that I will convey the results of this meeting to responsible parties, for them to have as much compassion to villagers as they're able to." He viewed this mission as requiring him to personally convey his committee's resolutions to Korn, Chuan, and the EGAT Board (Wichian 1995b). In a television show several years later, referring to his role in negotiating the agreement that ended the 157-day protest, Plodprasop claimed that "Pak Mun got its generators running because of me" (EGAT 2001a).

Decision to compensate for perpetual loss of fisheries (1997)

In January 1997, the Assembly of the Poor (AOP), the national social movement organization that emerged in late 1995, organized a multi-issue, demonstration outside Government House.

Fisheries livelihoods at Pak Mun constituted one of the key demands presented to PM

Chavalit Yongchaiyudh's government. Villagers claimed that despite the fish stocking program, they had been unable to sustain fish catches since the closure of the dam gates for hydropower. The fish ladder did not allow economically important fish to migrate.

By April 1997, during what late became known as the 99-day demonstration, negotiations between AOP and government representatives had yielded a number of favorable agreements favorable to the AOP. Among these was an agreement to compensate eligible Mun river households for perpetual damage to fishery-dependent livelihoods. Chavalit's administration agreed to provide 2.4 ha (15 *rai*) of land, or monetary equivalent at $US8750 per ha, for 3080 Pak Mun fisher households.

Mobilizing and bargaining during the Chavalit government

The immediate political context in which this rally took place included the unstable nature of Chavalit's new coalition government, as well as grassroots activists' coalition building that had taken place during 1995–96. That had resulted in the emergence of the AOP, and its 50-issue set of specific grievances. Ranging from proposed and completed infrastructure projects to problems of access to land and forest, the AOP petition helped mobilized large demonstrations to pressure Chavalit's predecessor (PM Banharn) in early 1996.

When the 1997 rally started, Chavalit's coalition government was popular with rural voters, but distrusted by urban elites, and still in the process of consolidating its power.

Protesters worked very hard to create the best possible political context or balance of power in their favour. They consistently portrayed themselves as serious, dignified, loyal and, crucially, committed to settling in for a long time to demonstrate for their causes (cf. Tilly 1999). They also portrayed themselves as interesting to the public, both theatrically and intellectually. The protest encampment and street processions made use of paintings and sculpture; the protesters also staged performances that served to entertain both immediate and media audiences as well as to lampoon the government. Demonstrators displayed their intellectual interests when they opened a "school of politics," inviting university lecturers and other public intellectuals to speak to them, as well as themselves preparing a contribution to the concurrent process to draft a new constitution (ibid, Ch 6).

The Chavalit government for its part took pains to appear responsive. The Bangkok Metropolitan administration provided significant resources by way of potable water and toilet facilities; the central government also authorized buses to transport representatives and interested parties to negotiation sessions. It also established seven different negotiating committees to respond to diverse grievances presented by the Assembly. The first negotiations commenced two days after the demonstrators descended on Bangkok. Finally, the Dams negotiation group was able to secure as its committee chair Adisorn Piangket, a northeastern MP whom activists regarded as sympathetic to their cause (Missingham 2003: 164).

On the other hand, a number of important factors weighed against any easy success at the negotiating table. First, demonstrators were frequently frustrated by the slow pace of the negotiations. This is not surprising, considering the large number of accumulated grievances they came to Bangkok with. Even assuming agreement on problem definitions and solutions, negotiations in each case were hampered by the sheer mass of facts, numbers, names, and other details.

Next, even though Prime Minister Chavalit provided high-level support, the AOP still faced significant institutional resistance to negotiation. For example, resistance from one irrigation official drafted to serve on the Dams committee involved questioning the very standing of villagers (and by extension the whole committee process) sitting across from him (Missingham 2003: 167). Finally, there were serious differences about what constituted the "real" status of fishing incomes following the construction of the Dam, and the Dam's role relative to other variables in a putative income decline (Missingham, 165–67; Buchita, 75; see Chapter 8).

Of 122 grievances/issues, Cabinet had taken action on 29 by the sixth week of the rally. Although some of these resolutions were not to the satisfaction of the AOP, the pace indicates a relatively high level of responsiveness compared to the previous Chuan administration. By 2 May 1997, when Assembly leaders declared the rally would disperse, they had negotiated the following commitments (Missingham, 169):

- 15 rai of land (or monetary equivalent, at 35,000 baht/rai) for 3,080 Pak Mun fisher households (for occupation change after permanent fisheries loss)
- Compensation for impacts from Sirindhorn Dam
- Compensation for five other constructed dams
- Cancellation of proposed Sayaburi Dam; review of four other proposed dams (including Kaeng Sua Ten)
- Agreements for occupational illness compensation
- Agreement for urban dwellers compensation
- Cabinet resolution to form joint committee to continue addressing all remaining grievances

The total amount of compensation approved for these items was an unprecedented 4.66 billion baht. A good deal of participatory committee work subsequent to the 99-day rally also appears to have led to problem closure (Missingham, 2003: 169). Chavalit's administration was by far the most responsive of any government in modern Thai politics.

Decision to reverse the 1997 Chavalit government resolutions regarding AOP demands (1998)

After the Thai financial crisis and resignation of PM Chavalit in late 1997, the second Chuan Leekpai government decided to withdraw the concessions made by the previous Chavalit government for lost fisheries income.

In April 1998, despite pressure from the AOP in the form of a large dry-season demonstration, Chuan's cabinet resolved to not pay *any* compensation for past development projects, arguing that this would open a never-ending series of claims, and that the government was broke. Essentially, it refused to honour any of the commitments to the AOP made by the Chavalit government. These reversals meant wider setbacks—for Thai highlanders who had won some rights to live in protected areas, for opponents of two other dams in the Northeast, and for villagers claiming compensation for Sirindhorn and Pak Mun dams (Missingham 2003).

AOP campaign for dam decommissioning (1999–2000)

In March 1999, the AOP launched a new campaign. It established a protest village occupying several hectares of a public park and river bank immediately adjacent to the Pak Mun Dam site. The Assembly announced it was abandoning its previous claim for permanent loss of fisheries income. After the Chuan II government refused to compensate, the Assembly demanded that the government *decommission* the dam in order to restore fisheries to the river.

In May 2000, after more than a year of government inattention to their protest village campaign, the Assembly dramatically escalated its campaign. It launched a sit-in demonstration, disrupting access to the Pak Mun Dam powerhouse, as well as a simultaneous blockade of Rasi Salai, an upstream irrigation dam in Srisaket province. At Pak Mun, the protesters denied EGAT staff access to the powerhouse for a number of days. They later agreed to move aside a few meters so that access could continue.

This dam blockade achieved what months of sit-in demonstrations outside Government House since 1994 could not: it conveyed to EGAT senior management that they needed to take much more active measures to resolve the conflict (Surapong, interview 20 August 2004).

MSP (Neutral Committee)

In June 2000, Chuan's cabinet established a bilateral ‘Neutral Committee to Solve Problems of the AOP.’ It was chaired by Bantorn Ondam, a former academic and respected social activist. Bantorn had previously served on the 1995 fisheries compensation negotiating committee chaired by Plodprasop Suraswadi.

The Neutral Committee's findings were ‘overwhelmingly in support’ of the Assembly's positions on all disputed issues, which included land tenure, just compensation, and the need for further impact assessments at several large dams (Missingham 2003: 207). For Pak Mun, the committee recommended a **four-month experimental opening to restore fisheries migration** (Neutral Committee to Solve Problems of the Assembly of the Poor, 2000). Chuan's government however chose to treat the committee's recommendations as non-binding advice.

Decision to allow WCD to conduct a detailed study on Pak Mun Dam (1999–2000)

The World Commission on Dams—a multi-stakeholder process funded by a range of development and private-sector donors—was a sophisticated attempt to conduct a series of participatory studies about the performance of large dams worldwide.

The WCD asked the governments of ten countries, including Thailand (Chuan II government), for permission to study the economic, environmental, and social impacts; the benefits, costs, distribution of these impacts; and the decision-making processes for these dams. WCD chose to study Pak Mun in part because its sponsors considered it an exemplary project. In June 1998, the World Bank's Operations Evaluation Department released a report saying Pak Mun’s resettlement program was ‘overly generous’ and denied the dam caused any decline in the fish population in the Mun (World Bank 1998). On the other hand, members of WCD such as International Rivers Network had helped campaign against the dam.

Thailand appears to have been the only WCD case study that proceeded while dam opponents staged protests, and these tensions required it to hold separate meetings with EGAT and with civil society. EGAT initially requested that the WCD defer its study until the conflict was resolved. A WCD commissioner and staff appealed for its cooperation, citing its overall timeframe limitations. It promised that the study would not be "judgmental" and that the knowledge generated would help guide governmental decision-making. After frankly expressing its desire that the study not further the demonstrators' cause, EGAT agreed to proceed.

The AOP also had concerns about the conduct of the study and initially wanted foreign experts to conduct it. Each side expressed concerns about consultants and specific research methods used but, with dedicated facilitation by WCD staff and consultants, did not abandon the process. WCD gave stakeholders several opportunities to help shape the report: in 1999, to comment on a paper outlining the scope of the study, and several times in 2000, as successive versions of the draft final report were issued.

In March 2000, the WCD released a draft summary of its Pak Mun case study. The evaluation was critical. While the final report (November 2000) was considerably more nuanced, it conveyed the same basic evaluation: of its intended hydropower benefits, the Dam delivered only 21 MW actual dependable capacity vs. 75 MW planned. Its economic cost-benefit ratio, calculated from the larger power generation figure, had been overestimated. Furthermore, despite the installation of a fish pass, it had reduced the diversity and overall supply of fish to income-poor, labour-exporting rural households (Amornsakchai et al. 2000a: Ch. 4). The report included dissenting reviews from the World Bank and EGAT, and responses to those reviews. It was a dense, multi-vocal compilation of knowledge.

Unfortunately, despite its well-designed and well-intentioned deliberative process, the WCD Pak Mun study ended in acrimony. The Thai Ministry of Foreign Affairs issued statements through its missions worldwide rejecting the findings of the WCD case study. In order to understand why the process ended this way, consider that in its response to the WCD report, EGAT steadfastly argued that:

Decision to allow an experimental dam opening and multi-disciplinary studies (2001–2002)

In January 2001 the Thai Rak Thai party, led by Thaksin Shinawatra, toppled Chuan's Democrat party in national elections. In March, acting on campaign promises, PM Thaksin visited AOP protesters encamped outside Government House.

His government quickly established a 'Committee to Resolve Problems of the Assembly of the Poor' led by Deputy PM Pongpol Adireksan, but the committee included no representatives or observers from AOP.

In April 2001, Thaksin's cabinet also accepted the recommendations originally made by the Bantorn committee under the previous government: it ordered EGAT to open all eight sluice gates of Pak Mun for four months, May-August, and for Ubon Ratchathani University (UBU) to conduct a multi-disciplinary study on the impacts of opening the gates.

Deputy PM Pongpol's committee set up several sub-committees. The University study was to be submitted to a task force chaired by the University's president. This group included representatives from the University, EGAT, and the AOP. It was supposed to report directly back to Pongpol's committee.

In addition, EGAT commissioned its own study, led by Thailand Institute of Scientific and Technological Research (TISTR et al, 2003). A notable component of this study consisted of questionnaires administered to 94 percent of the 6176 households that had received fisheries compensation.

Villagers themselves, coordinated by Southeast Asia Rivers Network (a Thai NGO that campaigns against large dams), initiated the participatory *Tai Baan* research project to document all fish species caught by villagers, along with other evidence of ecological change in river condition (Srettachau, 2002; Friend et al. 2009). The new studies were attempts to generate different knowledge discourses from which to argue competing options: Should Pak Mun Dam open indefinitely, as opponents demanded? Should it stay closed to generate hydropower, as EGAT would prefer? Should it, as a compromise, open seasonally, and if so, during what months, and based on what evidence?

By the end of the first four-month trial opening period, the AOP felt it had strong evidence that the opening had allowed fish migrations to occur. Some activists embarked on a long march to publicize the good news. In December 2001 the four-month experiment was extended to one year after the trial dam opening task force accepted an argument from its AOP member that the study needed a full year to observe all seasonal effects. In June 2002, a few days before the one-year opening of the dam was to expire, EGAT offered to open Pak Mun Dam seasonally, July through October, ceding the option to generate hydropower from approximately 52 percent of the river's average annual flow.

UBU findings

UBU began presenting findings in September 2002. It reported that although households interviewed wanted irrigation water in the dry season, new river-pumped irrigation systems would have a minimal positive impact. Soils were poor, pumping costs were high, and farmers lacked capital inputs needed to grow high-value dry-season crops.

The University's executive summary contained four options – maintaining the status quo; a five-month seasonal opening; an eight-month opening; and a year-round opening for five years. Crucially, UBU argued that for at least another five years, the dam's chief benefit, improving electric power reliability in the lower Northeast, could be substituted by increasing electricity imports. Technical substitutes existed for goods provided by the dam, but none existed for improving the security of community-based livelihoods (UBU 2002).

Different actors immediately interpreted this document in different ways, to argue their respective positions. Opponents of the dam – activists and a handful of media columnists – initially wary of the University, echoed its key argument. Others, including print and radio journalists, accused some of the researchers – in particular the authors of the Executive Summary – of conspiring with the AOP.

Decision to open Pak Mun dam four months a year (2002)

In late September 2002 Deputy PM Pongpol's committee recommended that Pak Mun should be operated under a four-month (July–October) seasonal opening policy. In October 2002 Thaksin's cabinet passed a resolution in accordance with this recommendation.

The AOP quickly denounced this decision, taken without benefit of public deliberation, and prior to final submission of the University's government-commissioned report. A vanguard of some fifty villagers descended to camp outside Government House in protest.

Villagers and AOP advisors lobbied erstwhile allies, such as Deputy PM Chavalit. They also sought 1970s-era student activists such as Prime Minister's Office Minister Chaturon Chaisaeng, and Minister for Natural Resources and Environment Prapat Panyachartrak. They also organized media-genic street dramas and seminars to criticize the decision (Foran 2006: 232).

Although the situation resembled a stand-off with the state very much in control, during this time a number of elites intervened in the media on behalf of the Pak Mun protestors. Former Prime Minister Anand Panyarachun and public intellectual Prawase Wasi both spoke out in favour of governance reform. Anand cited recent events at Pak Mun as an example of poor accountability. The government promised a decision based on a university study, and then ignored that study (*Khao Sod* 2002b). Prawase urged thinking beyond opening or closing Pak Mun, towards small-scale alternative energy and distributed power generation (*Phuchatkan Rai Wan* 2002).

MSP (Senate Committee on Public Participation)

On 18 November 2002, on petition by the AOP and its allies, the Senate Committee on Public Participation held a hearing. EGAT Governor Sitthiporn Rathanopas conceded that EGAT could reliably supply the lower Northeast's growing power needs by expanding transmission lines, hence hydropower from Pak Mun was not indispensable.

Based on this admission Dr. Mongkhon Visetsuk, the incoming president of UBU, reversed his position. Mongkhon, although not a member of the UBU study team, had taken on a role as the official interpreter of its findings. He endorsed the four month seasonal opening as the best option. This position however put Mongkhon in dispute with less senior colleagues who served on the study. These academics now took on an advocacy role, and spoke in favor of a year-round opening, at seminars organized by the AOP. After the 18 November hearing, Mongkhon also decided to back a year-round opening for Pak Mun (Foran, 2006: 232–34).

Thaksin's intervention: Televised MSP and opinion poll

In December 2002, following unexpected harassment of demonstrators outside Government House, PM Thaksin intervened in the case. On 20 December, he chaired a three-hour problem-solving meeting with 30 AOP representatives. NGO advisors were not allowed to participate. UBU president Mongkhon appeared alongside his study team leaders and spoke in favor of a year-round, trial opening for five years.

Almost immediately after the roundtable, the Prime Minister ordered a special task force set up, reporting to Energy Minister Pongthep. The group included staff from the Ubon contingent of the armed forces, the National Statistics Office (NSO), and the Interior Ministry. Thaksin ordered the NSO to survey rural residents' attitudes in the three districts of the lower Mun river. In addition to this late study, the Prime Minister asked officers in the Second Army and the Border Patrol Police, units with bases in Ubon, to report on local opinion regarding how Pak Mun Dam should be operated.

NSO completed its work in only three days (24–26 December 2002), sampling 3,750 adult household representatives from 150 villages. Only four percent stated that fishing was their primary 'occupation' (*achip*); less than seven percent stated it was their secondary occupation (National Statistics Office 2003a).The least disruptive and most favoured option was the four-month, seasonal opening. This was the same option the local authorities and EGAT had been promoting since June 2002.

Several weeks after the poll, at the request of Pak Mun activists, NSO held a public meeting about its survey. Dam opponents argued that in the context of rural livelihoods, it would have been more accurate to ask villagers about their fishing activities, not if they regarded fishing as their 'occupation.' One villager asked: 'Why didn't you gather information using wording such as "Pho Yai [grandfather], do you have children or grandchildren that fish?"' This implied that the response to this question would have been different than to questions based on '*achip*' (see Foran 2006: ch. 8 for analysis).

Decision to provide a livelihood restoration package (2003)

In January 2003, several weeks after the NSO poll, the cabinet re-iterated its resolution to operate Pak Mun Dam with a four-month opening, while offering a package of limited support for fisheries dependent villagers. On 29 January 2003 some five hundred villagers outside Government House were evicted by the Bangkok governor. As of 2008, the 14 January 2003 cabinet resolution still represents Thailand's basic policy statement regarding the value of Pak Mun, and its future mode of operation.

As part of the 2003 cabinet resolution, the Royal Irrigation Department (RID) announced an 807 million baht ($US20 million), five-year pumped-water project to expand existing stations and build new works. Investment focused on villages in the upstream vicinity of Pak Mun Dam, but would eventually extend almost 80km upstream towards the provincial centre. The 'Pak Mun Irrigation Project' was framed as a special development project and did not require a cost-benefit test. The project would build a constituency of local people interested in dam-induced high water levels.

Pumped-water irrigation supplies river water to fields by large electric pumps mounted on floating platforms. First provided during the 1980s, about 70 such systems exist on the Mun River in Ubon Ratchathani. But as of 2003, the three lower Mun districts of Phibun Mangsahan, Khong Chiam, and Sirinthorn had only 16. Unlike gravity-fed irrigation, which is currently supplied without user charges in Thailand, farmers using pumped water had to pay up to $US2 per hour in 2002.

As part of the UBU study discussed above, a team from the Faculty of Agriculture studied farming practices in four districts in the lower Mun. They found that pumped water was used primarily at the end of the dry season to raise rice seedlings for the main rain-fed rice crop, and secondly to grow higher-value crops such as watermelon and chillies and stock fish ponds in the dry season. However in 2000-02, the average usage rate in the existing scheme was only 14 percent of the total projected irrigable area (UBU, 2002, page khor-6). Dam supporters argued that during the trial dam opening, water levels in the Mun were too low to operate the pumps, but UBU (2002) concluded that such problems could be solved with relatively minor retrofits.

4. Case analysis of water allocation decision-making processes and tools

4.1 Key contextual factors and arenas

What are the important contextual factors and attributes relevant to the determination of pathways and outcomes of the decision-making?

In a long-running case involving Thailand, context needs to be explored at several scales, including macro-historical contexts of meaning and structure, such as 20th century Thai democratization (see Foran 2006: ch. 4). We also need to consider durable institutions, such as power system planning, and state conflict management processes.

Power system planning

EGAT conceived of Pak Mun Dam as a solution to rising peak power demand in NE Thailand. Because of transmission line capacity constraints, planners regarded (and continue to regard) the Northeast and South regions as the most vulnerable to power reliability problems. The preferred solution is to build new sources of peaking power and locate them within (or as close as feasible) to each of these regions so as to minimize transmission losses.

EGAT's Power Development Plan (PDP) emerges from a closed planning process that begins with a national load forecasting sub-committee and ends with approval by the Cabinet. The process has extremely limited civil society participation, no oversight by parliament, and limited participation by other stakeholders. Of all the agencies involved, EGAT plays a major role in shaping the details of what appears in the PDP, particularly plant size, fuel source, and location. These conditions prevailed in the 1980s, at the time Pak Mun was identified as a potential addition to the Thai power system. They prevail today. The continuity surrounding the PDP process is remarkable considering the dynamism surrounding EGAT. The paradox is partly explained by the fact that most of the attention put on EGAT and the energy sector during the past decade has been couched in terms of the social costs and benefits of particular plants, and in terms of privatization.

To their credit, EGAT and other agencies have given increasing attention to the concern of how to supply energy services in a manner that is cost-effective and environmentally sensitive. However EGAT's financial incentive structure still discourages more significant investment in energy conservation (Foran 2006: ch. 5).

State-society relations around rural development in Thailand

By the 1980s, the public sphere so vital to voicing opposition had distinctly increased in Thailand. Yet the state's predominant response to calls from civil society for a more deliberative process was notable for its aloofness. This combination of increased tolerance for speaking out, on the one hand, and institutional aloofness on the other, meant that Thai people had both cause and opportunity to articulate their grievances publicly. They did so more and more readily during the 1980s and especially the 1990s (Foran 2006: ch. 4).

As in many other cases, Thai NGOs stepped in to help villagers publicize their grievances. NGO narrative work cast the problem in terms they had developed from work begun in the late 1960s (Foran 2006: ch. 4). We can identify two basic components: first, a "community culture" frame portrayed the village economy as inherently superior to dependent capitalist development (Phongpaichit and Baker 1995: 387). By extension, it defended the need to protect the common natural resource base of local people against a resource-grabbing state. In the case of the Mun river, the key resources this framing defended were the most fertile farmland, wild-capture fisheries, and natural tourist attractions (Ladawan et al. 1993).

Second, NGOs presented an injustice narrative. The state trampled over what activists saw as basic rights such as transparent information provision and participation in project planning. Opponents complained vocally about the state's closed practices, its lack of reliable information, and at times, its arrogant handling of public meetings. They decried plans to resettle inundated farmers on land with less secure titles (ibid., 4).

State conflict management processes

What was the arena/s used in the decision-making processes? How was this defined, legitimised, accessed or created?

Thailand has evolved ad hoc problem-solving committees for conflict management. Problem-solving committees are usually appointed by and report to the Prime Minister or the cabinet, as opposed to parliament. The main committee may establish more than one level of subcommittee, which increases the chances that project opponents, academics, and other stakeholders may directly participate and observe. However, it is typical for the main committee (with decision-making power) to include only civil servants and elected politicians. This kind of institutional arrangement has several weaknesses (discussed below in Section 4.4).

Mediated space

Professional news media

Like other modern mass media, Thai news media focus on dramatic events on the one hand and routine elite politics on the other. Far more so than in Western democracies, however, Thai print media coverage privileges the government (as opposed to the parliamentary opposition). A news story typically consists of extended quotes of statements made by top political leaders (first and foremost), followed by quotes from opponents much further down the column. Local authorities and village reading stations (*sala*) tend to receive leading circulation newspapers like *Thai Rath* and *Daily News* (Foran 2006: 338).

Media coverage of the entire Pak Mun conflict has not been systematically studied. However, throughout the controversy, the overwhelming impression is first that coverage in the two main English-language broadsheets, *Bangkok Post* and *Nation,* has been sympathetic to activists. Second, large circulation papers such as *Thai Rath* and *Daily News* have given much less coverage than broadsheets (such as *Matichon, Khrungtep Thurakit, Phuchatkan Rai Wan*) and what coverage they provide is often negative (Foran 2006: 256; (Chalermsripinyorat 2004).

Mediated spaces sought by contending actors

In order to improve their legitimacy, generate mass media coverage, and reach their target constituency of elites, the anti-dam movement generated its own media. They wrote letters and press releases. They produced videos (AOP 2000b), organized seminars (Apaporn, interview 24/8/02), published rebuttals (e.g., Working Group to Monitor Impacts 1993) and position papers (Assembly of the Poor [AOP] 2000a).

During the pre-operation period (1989-1994), most of EGAT's pro-dam publicity was delivered in Ubon, in the form of leaflets, announcements delivered to villagers by local authorities, radio programs, and occasional television commercials (mostly on Channel 11, operate by the Department of Public Relations.

After the AOP's disruptive occupation of the Pak Mun powerhouse in May 2000, EGAT began more combative public discourse. While continuing to invest in print and TV advertisements promoting the benefits of Pak Mun and the fishpass (e.g., on Channel 11, run by the Thai Department of Public Relations), it began attacking dam opponents. Its published *The Truth at Pak Mun Dam*, a 79-page compilation of facts about the project, rebuttals to the WCD, interviews, and newspaper articles and columns articles compiled from *Daily News*, *Naew Na, Thai Rath,* and *Thai Post*, with a negative analysis of Thailand's radical NGOs (EGAT 2000).

4.2 How decisions were made: a pathways and mechanisms model

Early decisions – to design, propose, and approve the dam – were made by elites in the executive branch following conventional (supply-oriented, least financial cost) power system planning practices. Such practices were of course grounded in conventional economic models prioritizing the need to provide electricity and irrigation to underwrite and boost economic growth.

However, by 1989, the year PM Chatichai's cabinet approved Pak Mun, provincial citizens began to resist the state's notification and consultation process. They objected to its low levels of transparency about impacts and affected people, and downward accountability. EGAT and the Ministry of Interior drastically misread how Thai society had changed by the 1980s. Implementation practices were inadequate compared to peoples' expectations (Foran 2006: 176).

As anti-dam mobilization emerged, state decision making took on a more reactive nature. On behalf of villagers struggling to secure livelihoods, advocates organized a series of collective actions. Dam opponents gained influence through disruptive and dramatic action, through appeals for transparency and justice, and by the production of local knowledge. These actions helped set decision agendas, and triggered helpful elite intervention.

Anti-dam mobilization influenced important decisions around compensation, benefit sharing, and operations at Pak Mun. However, it also triggered reactive counter-mobilization and occasional violence. Unintended outcomes – such as sympathetic media coverage following episodes of violence – challenged elites. Elite decision makers occasionally reconsidered their options, and made concessions. Multi-stakeholder discussion provided opportunities for dominant and oppositional framings to confront one another and for elites to experience first-hand the balance of contending interests.

One effective way to understand decision making is **to re-construct pathways** – sequences of social mechanisms which lead causally to decisions of interest. Social mechanisms ("drivers") are robust processes of interaction: processes which are observed and inferred as occurring in a similar manner, regardless of specific micro-political contexts. They require prior grounding in a conceptual framework.

Conceptual framework

Politics can be explored using a conceptual framework consisting of actors' interests, prevalent discourses, and institutions (Foran 2006; Lichbach and Zuckerman 1997).

Actors follow their *interests*; however these are discursively constructed and subject to change in the course of deliberation (Hajer 1995; Migdal 1997; van den Hoven 2004). *Institutions* matter, because actors' interests are constrained by their norms and routines. To avoid confusion it is best to define institutions more narrowly, as *specific institutionalized practices* (e.g., electricity planning or modes of public consultation) as opposed to more diffuse norms and values. The latter concepts are assigned to the category of *discourse*. I then conceived of institutions as sites where discourses are deployed.

Both interests and discourses drive politics, but in a manner shaped by institutions. Interests, discourses, and institutions possess different capacities to act and susceptibilities to change (John 1998; Sayer 1992). For example, discourses (e.g., specific models of rural development) can shape individual decision makers' preferences. However, such models can be attacked for failing to resonate with an audience's experience, its cultural beliefs, or empirical "facts". Institutions reproduce legitimating practices, yet they can be disrupted if their rationality is challenged often enough and loudly enough by outside actors. Individuals can be threatened or persuaded to cooperate, but can also engage in collective action (e.g., advocacy networks and movements).

In this framework, actors strategically use certain rhetorical forms (argumentation schemes and modes of attribution) as power resources. At the same time, the semantic field their rhetoric draws from necessarily shapes their cognition. Specific institutional routines also constrain action (Foran 2006: 238).

Using pathways to situate decision events

To study decision events it is helpful to identify *pathways*: causal sequences that lead to outcomes of interest (see Figure 2 below). Pathways are sequences of necessary and contingent social processes. "Necessary" means the action is inferable given the causal powers and liabilities of objects in the conceptual framework. "Contingent" means not deducible from the conceptual framework (Blaauw and Pritchard 2005; Mahoney 2000).

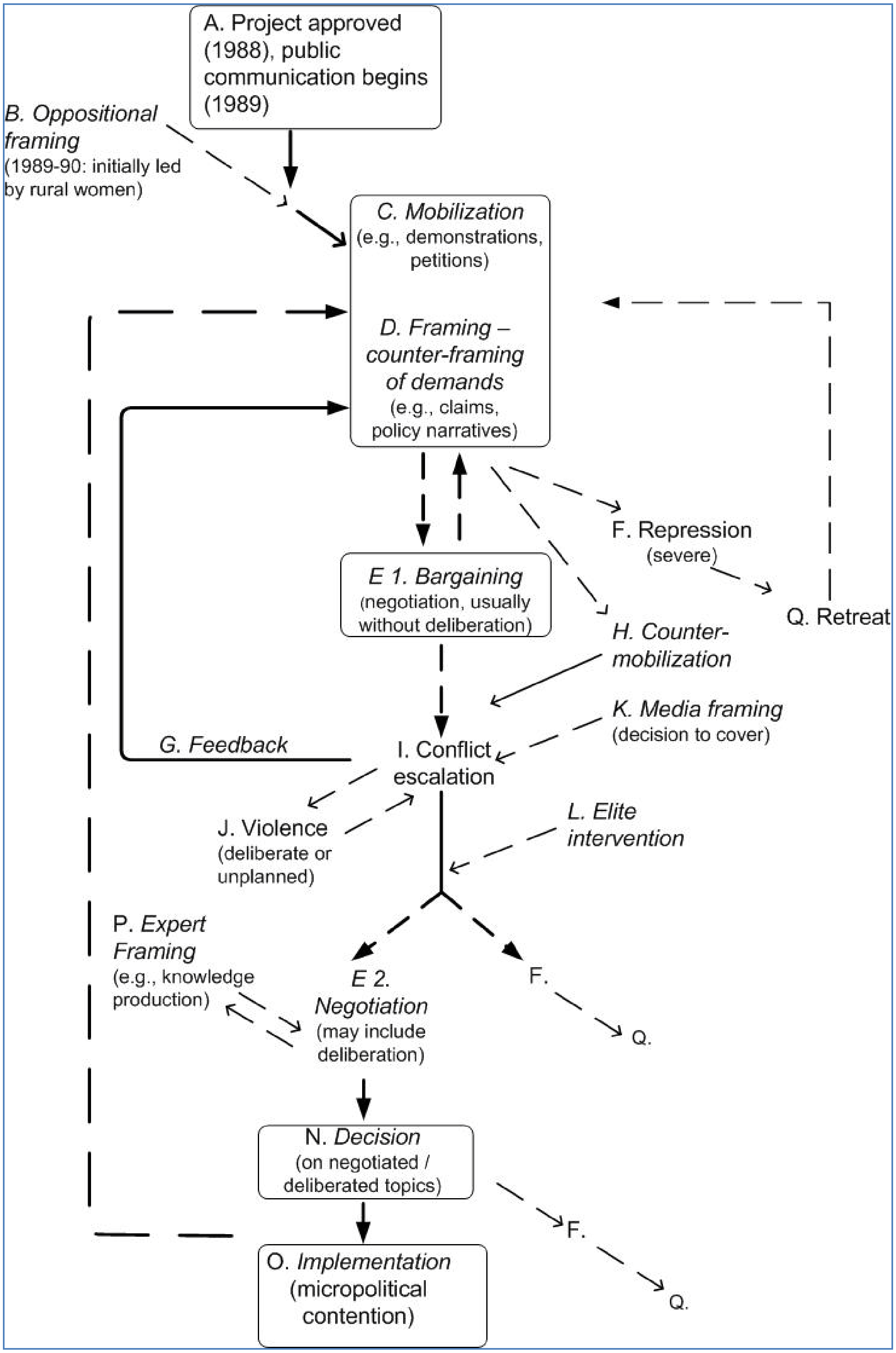
In the simplest terms, Pak Mun's trajectory can be viewed as a series of episodes consisting of: {**[framing disputes] . . . [mobilization] → [repression] . . . [negotiation]**} (Figure 2), where the ellipsis (. . .) denotes a contingent relationship, and the arrow denotes a necessary relationship.

Figure 2 lays out a broad cyclic pathway beginning with state indications of intent to develop Pak Mun Dam, followed by framing disputes, anti-dam mobilization, occasional counter-mobilization, conflict escalation, and either negotiation to resolve challengers' demands, or rejection of negotiation.

This pattern repeated itself at least four times between 1989 and 1994, when the dam was commissioned; and four times between 1994 and the decisive seasonal opening declaration in early 2003.

Each italicized term in these pathways can be considered a social mechanism. Mechanisms (drivers) are robust processes: they possess similar basic causal properties across cases and contexts but produce *different* outcomes depending on the presence of other mechanisms, on sequencing in a series, and contingent events that initiate them (such as unanticipated violence). Hence rather than generalize about outcomes it is more useful to generalize about mechanisms, then look for recurring sequences of mechanisms.

Figure 2 Pathways involving contention and advocacy around Pak Mun Dam


A. Project approved (1988), public communication begins (1989)
B. Oppositional framing
(1989-90: initially led by rural women)
C. Mobilization
(e.g., demonstrations, petitions)
D. Framing – counter-framing of demands
(e.g., claims, policy narratives)
F. Repression
(severe)
Q. Retreat
E 1. Bargaining
(negotiation, usually without deliberation)
H. Counter-mobilization
K. Media framing
(decision to cover)
G. Feedback
I. Conflict escalation
J. Violence
(deliberate or unplanned)
L. Elite intervention
P. Expert Framing
(e.g., knowledge production)
E 2. Negotiation
(may include deliberation)
F.
Q.
N. Decision
(on negotiated / deliberated topics)
F.
O. Implementation
(micropolitical contention)
Q.

35

Notes: Feedback (G) can be triggered at any time, especially after mobilization escalates.

4.3 Review of mechanisms (drivers)

Rhetorical framing/counter-framing

Framing/counter-framing refer to competitive rhetorical action, deployed to further a political objective. Framing/counter-framing occur throughout an episode of contention. Such discourse can range from terse speech acts (fragments of narratives) to the more elaborate knowledge claims in policy narratives and scientific reports.

The term "rhetorical action" refers to the competitive, strategic, monologic use of language by actors to persuade audiences of preferred courses of action (Naurin 2007).

Pak Mun activists deployed a rhetoric of legitimacy in numbers, a welfarist argument of lost opportunity, a rhetoric of environmental restoration; and finally, when attacked by Thaksin's administration as a minority, they resorted to a basic rhetoric of justice. Considering Thailand's political and economic volatility and the changing series of antagonists they dealt with, these diverse rhetorics are hardly surprising. The strategically evolving rhetoric of social-movement actors nonetheless appealed to a common discursive frame. In contrast with the dominant model of state-led modernizing transformation, the AOP's frame anchored to social justice, popular participation, and defence of natural resources as common property (Foran 2006: 246). A recurrent demand activists made was for expert framing of disputed claims.

Examples of framing by authorities include claims that:

▪ The project had already been approved [or] construction has already started [or] the dam has already been built . . . so therefore the project must proceed (Pak Mun, 1991 onwards)

▪ Dispute settlement powers have been devolved to appropriate authorities (Pak Mun, 1993–94)

▪ EGAT has already paid out more than 989 million baht in compensation (Pak Mun, 2000 onwards)

▪ People want water, so only a wet-season opening is appropriate (Pak Mun, 2001 onwards)

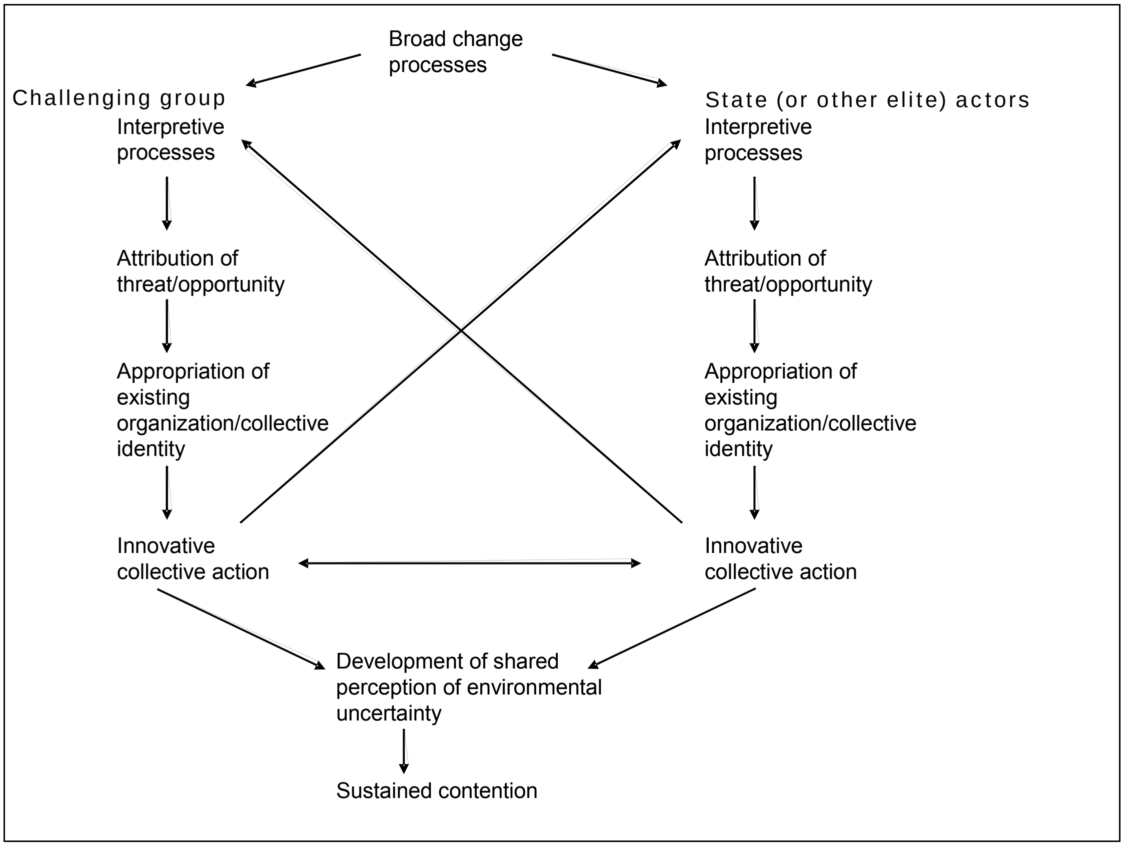
(ibid, 326)

Counter-framing is more aggressive framing. It justifies government stalling or inaction on activists' demands, and may accompany other bargaining. A ubiquitous component of Thai counter-framing is to attribute negative traits to activists – e.g., as "people who can never get enough," as troublemaking NGOs. In closed spaces of "final" decision making, such counter-framing disarms radical policy narratives.

Mobilization

Mobilization refers to innovative collective action on the part of a challenging group, *as well as* state or other elite actors, in response to perceptions of political threat or opportunity (McAdam 1999; McAdam, Tarrow, and Tilly 2001) (see Figure 3 below).

Figure 3 Framework for analysing mobilization in contentious politics



Source: McAdam et al. (2001: 45).

For a social movement to emerge it must draw on an existing organisational base – whether a formal organisation (e.g., the southern Churches in the U.S. civil rights movement) or informal networks (e.g., village women's weaving circles, in the case of the anti-Pak Mun Dam movement5) – and "appropriate" it to disseminate new claims and mobilize (McAdam et al. 2001; Figure 3). People who participate in a movement must possess both a minimal degree of income security as well as social/spatial proximity to movement activities. Movements must also motivate people to join (see Foran 2006: 25–26).

Snow et al. (Snow et al. 1986) emphasize the story-telling work that movement organizers strategically do in order to shift their cognitive constructions. Leaders must convince people that a social problem can be solved with joint action of a certain kind. Such frames are most effective when they align with the worldviews, causal beliefs, and life experiences of potential members. Goodwin and Jasper argue that moral and emotional dimensions can play an important role in recruiting people to join a movement, ranging from outrage over a particular event conveyed via the mass media to the esteem recruits may have for existing members (Goodwin and

Jasper 2003: 54). In local settings people reluctant to join might nonetheless do so out of the fear of ostracism (McAdam 1999: xxxv).

What sustains collective action in the face of indifference or hostility from authorities? It may be benefits members of a challenger group get from everyday interaction with like-minded people, i.e., a sense of community (Meyer 2002). As well, it may be the creation of alternative social spaces or networks (Whittier 2002). Other scholars emphasize the work of political entrepreneurs, who continually promote their ideas as solutions to political events (Kingdon 2003). Writing about the AOP, Missingham (2003) gives much weight to the strength and efficacy of a democratic network in which NGOs played a key leadership function. However, these factors were not the only causes of sustained mobilization.

Dramas of concession and denial

Events in the Pak Mun case suggest that one important reason people kept on challenging the state's handling of Pak Mun was that state agents persistently responded with a *mixture* of concession and denial.

For example, concessions about due process made during Prime Minister Anand's government in 1991 (Niyom committee; see Section 3.3.3) needed to be fought for again during the subsequent Chuan administration. PM Chuan's government first granted these concessions in the form of a 1993 multi-stakeholder committee to review the scope and eligibility of compensation (Akhom committee; Section 3.3.4). Later it revoked the high-level multi-stakeholder process when senior decision-makers perceived it as too threatening to established practices. Similarly, the Chavalit government resolved in 1997 to compensate for permanent loss of fisheries income. The second Chuan government overturned it in 1998. These tantalizing and frustrating dramas of concession and denial spurred opponents to keep struggling.

Repression

Repression can be defined as any deliberate action by authorities or bystanders that increases the difficulties of collective action. Such repression can range from severe violence (e.g., assassination campaigns aimed at movement leaders) to intimidation (state investigations of movement organisations) to "everyday" discursive repression (attacks on movements' credibility conveyed in mass media). A striking theme in the social movement literature is the ubiquity of repression (Foran 2006: 26).

Under what conditions do state elites switch between severe and "everyday" repression? In general, we would expect that as protest movements learn to restrain their demands or act within institutional parameters, state repression declines. Over time, many movement tactics lose their novelty: Thai authorities have learned to adapt, for example, to marathon sit-in demonstrations. Their incentives to do so are strong, because in so doing they regain control of the interpretive struggle. What they have not learned to repress are protest movements that use more sensationalistic tactics – such as hunger strikes or suicide attacks. These are more inherently disruptive because of the violence that is deployed and the sensationalistic appeal such events have for the media.

Elite intervention

The mobilization of elite technocrats and politicians to intervene in a contentious case usually occurs after sustained mobilization and media coverage contribute to escalating an issue. Elites intervene to advance and – more commonly – to defend their interests (McAdam 1999), with a range of unexpected consequences. Not surprisingly such intervention is a common occurrence in contentious politics (Tarrow 1998). The combination of elite intervention and counter-framing has the power to co-opt policy proposals from civil society. Such outcomes are likely without inclusive deliberation proximately timed before a final decision.

Some important elite interventions exploit organizational ambiguities. All institutions are ambiguous in the sense that they allow room for discretion and rule-interpretation. At EGAT, the combination between closed electricity planning processes and ambitious elites allowed Sithiporn Rathanopas to expand the DSM program in the early 1990s when it was under his control and later as EGAT Governor in 2002–03, to propose building new dams on the Salween river.

Elite action may have an emergent logic. An elite actor may be tasked to handle a particular conflict, and end up doing more than anyone expected in light of the circumstances. The chair of the special fisheries compensation committee at Pak Mun (1994–95) is a notable example. Fisheries Director Plodprasop Suraswadi portrayed himself as someone who extended himself to negotiate on behalf of dam protestors, and more than five years later the agreements reached in his committee were cited by dam opponents to justify their campaigns.

Conflict resolution mechanisms

The fact that elites changed their positions during the course of engaging with each other and with grassroots dam opponents suggests that we need to identify mechanisms that capture interactions such as bargaining (in its different forms), and arguing.

In a helpful typology, Naurin first distinguishes between whether common understanding is sought or not. If no, the interaction can be classified as "bargaining"; if yes, it can be regarded as "arguing." Second, the interaction can be analyzed as competitive, for example making a claim to a finite resource, or cooperative.

Table 3 shows important theoretical commonalities between rhetorical action, integrative bargaining, and deliberation. In *actual* interactions these processes co-occur. Foran's analysis of Pak Mun (2006) stresses the causal power of rhetoric: framing is a fine-scale driver in its own right. We can expect to find framing in *all* of the above procedures, in varying proportions. Using close textual analysis, some analysts attempt to distinguish moments of deliberative speech from moments of rhetorical action in actual dialogue events (Holzinger 2004).

Bargaining

In the Pak Mun case, initial mobilization such as a demonstration in front of a government office, could lead to short-term tactical bargaining. For example, in October 1994, after ten days of rallying in the grounds of the Ubon provincial hall, authorities offered to compensate 10,000 baht for loss of fisheries income caused by dam construction (see 3.3.6 above).

Some bargaining could be even more limited, for example the offer to accept a petition from a group of demonstrators and convey it to a senior official, in return for an agreement to disperse.

However, more serious bargaining tended to require significant conflict escalation (Figure 2). Escalation could result from violence (planned or unplanned), a burst of media attention as protestors staged new actions, or elite intervention. Such intervention in turn could facilitate bargaining negotiations or more public debate (“arguing”).

Table 3 Analytical classification of conflict resolution procedures

	Discussing ("arguing"; "discussion on merits")	Bargaining (negotiation)
Competitive	Rhetorical action Problem: disagreement between actors caused by different viewpoints, discursive frames Goal: persuade other of one's preferred course of action Mode: monologic, "plebiscitory" reason	Distributive bargaining Problem: disagreement caused by conflicting wants Goal: maximize preferences ("wants"), at the cost of others if necessary Mode: Pressure (threats and demands), concessions, "signaling commitments"
Cooperative	Deliberation Problem: disagreement between actors caused by different viewpoints, discursive frames Goal: common and better understanding of right course of action Mode: dialogic, explore understandings of facts, norms, narratives	**Integrative bargaining** ("consensus based negotiation") Problem: disagreement caused by conflicting wants Goal: maximize wants Mode: clarify wants, search for optimal compromise, trading via issue-linkage

Source: adapted from Naurin 2007

Discussing (arguing)

By discussing I mean face-to-face reason-giving debates and exchanges, in contexts understood by participants to be of heightened importance cf. (Ryfe 2005). Defined this way, discussing is equivalent to what Naurin (2007) calls competitive *and* cooperative 'arguing' in Table 3 above.[6]

Public discussion has a performative aspect: it is an opportunity to make policy issues salient and to bring them to life before an audience. Such discussion is important because it allows rival actors to engage in an open policy contest, which at the same time is received by a diverse audience including media, decision makers, and civil society. The outcome of any given session is not necessarily a good indicator of how a “final” decision will be made. Private discussion among elites probably matters more. But such exchanges are important in the Thai institutional context because of their paucity.

As the Pak Mun case shows, it is one of few opportunities for dominant and oppositional framings to confront one another, for elites to experience first-hand the balance of contending interests, and for actors to modify their preferences.

Deliberation

The literature on "deliberative democracy" celebrates the value of decision-finding practices that are inclusive, autonomous, equal, and reflective. Ryfe (2005) however argues that deliberation is a "difficult and relatively rare" form of communication. He cautions that even in OECD countries, historical, institutional, and cognitive obstacles impede setting-up and sustaining deliberative processes (i.e., cooperative discussion) involving ordinary citizens. Participants are expected to engage in sustained reflection and question taken-for-granted policy narratives; such expectations are often psychologically challenging.

Tilly (2004) argues that we can analyse a social mechanism in terms of (1) processes/mechanisms that generate the mechanism of interest, and (2) processes/mechanisms that “constitute” (sustain) it. Using deliberation as an example, processes that help initiate deliberation include a context of **high stakes** and **pressures for accountability** (Ryfe 2005: 57). High stakes and accountability pressures matter more than **ideal design** (ibid., 63). Sustaining processes include:

diverse stakeholder participation

quality of leadership/facilitation

procedural rules (e.g., **civility, equality**).

Important as well to sustaining deliberation are **motivational stories**, which participants are told and tell themselves to motivate their continued participation.

[6] Naurin (2007: 561) notes that "arguing" instead of "discussing" is commonly used in the literature and traces this to the possible influence of the German word "argumentieren" used by Habermas to denote strategic rhetorical action.

Otherwise, participants may choose to exit talk-oriented deliberation in favour of direct political action (e.g., lobbying, legal action), or in favor of apathy (a particularly acute problem for public goods).

4.4 Use of progressive processes and tools

What progressive processes or tool/s have been used (or not used)? If progressive processes or tools were not used at all, what might have been the constraining factors or condition? Would their use likely change the arena and outcome of decisions?

Table 4 shows a number of social processes and techniques ("tools") of interest to PN67 as well as three other processes that are relevant to the Pak Mun case.

Comprehensive options assessment (COA)

By 1989, EGAT planners were exposed to integrated resource planning (IRP), which is one form of COA (Foran 2006: ch. 5). EGAT's Demand-Side Management (DSM) Office, established in 1993, went on to plan and implement successful energy efficiency programs (Foran et al. 2006).

In an IRP analysis, demand-side and supply-side options are given balanced treatment, with the objective of investing in the least-economic cost first. IRP can be done for energy and for water resources. Depending on the scale chosen, the integrated plan can be conducted at the national level, or at the level of a particular utility's service area.

Since IRP requires engineering and economic data, utilities typically perform it. IRP has not always been popular: during the 1990s, the belief that privatization makes detailed planning unnecessary prevailed. In the 2000s, the value of long-term public planning has been rediscovered. This comeback follows events such as market failures in the U.S. West coast electricity markets, as more recent momentum to lower GHG emissions.

IRP can be designed as an integrated, participatory assessment, and in recent years a number of independent analysts have called for Thailand to initiate such a process (Decharut Sukkumnoed 2007).

The main obstacle to IRP is institutional: the traditional rate-of-return financial incentive structure means that revenues and profits are tightly coupled to volume of energy sales. This gives electricity utilities little motivation – beyond public image – to invest in DSM or to conduct IRP. In North America many have been required to do so by strong regulators.

Table 4 Use of social processes and tools in the Pak Mun case

Process or Tool	Relevant	Applied	Notable examples in Pak Mun Case / Comment
PN67			
MSPs (platforms for	Y	Y	Niyom committee (1991; after

Process or Tool	Relevant	Applied	Notable examples in Pak Mun Case / Comment
multi-stakeholder bargaining and discussion)			campaign for transparency) Akhom committee (1993; after campaigns for accountability) Plodprasop committee (1995) Neutral Committee (2000) Senate Committee on Public Participation (2002) PM Thaksin (2002), televised roundtable
Scenarios, including environmental flows scenarios	Y	Y	By UBU – intuitive qualitative scenarios offered comparing how opening the dam would affect livelihoods under different alternatives
Water resource modeling	Y	Y	By WCD to study hydropower benefits in detail (Annez 2000)
Market based instruments	N	N	
CIA and SEA	N	N	Relevant to basin-scale sustainability planning
Other processes and tools			
Fisheries catch monitoring	Y	Y	By *Tai Baan* project (Srettachau 2002) and by UBU (2002) but no regular monitoring.
Comprehensive options assessment (part of WCD [2000] framework)	Y	N	Highly relevant, but not applied in planning of dam. Power flow analysis by UBU (2002) confirmed that removing Pak Mun from the grid would not affect reliability.
Multi-criteria evaluation of sustainability	Y	N	Multi-criteria protocol was developed by IHA (International Hydropower Association 2006) but not well publicized. This effort has been revived in 2009.

Source: analysis by author

Multi-stakeholder processes (MSPs)

MSPs can be defined as organized processes designed to facilitate active and informed participation in particular policy issues. Defined broadly this way, MSP processes include both bargaining and discussion. Analysis of the Pak Mun case reveals at least five significant MSPs (see Table 4).

Pathways leading to MSPs

Pathways leading to MSPs were contentious, volatile, and tortuous (Figure 2). Notable parallels exist between the 1991 dam opponents' campaign for transparency and deliberation reviewed above, and their 1993 campaign to hold the state accountable for dam impacts. In both cases dam opponents pressed the state to establish MSPs (see Section 4.x above). In both cases a concerted demonstration that began in Ubon was forcefully repressed, ended up in Bangkok outside Government House, and eventually led to substantive negotiations (see Foran 2006: 184–191). In both cases state elites initially allowed an MSP with decision making power to be established. Both MSPs included representatives of EGAT, the government, academics, and affected villagers. In both cases, direct and tangible outcomes of the committees' work appeared slight, but indirect outcomes were significant.

During the 1994 campaign for fisheries compensation and in subsequent the state learnt to tolerate and ignore protest actions, thus prolonging them. In these campaigns MSPs were established after conflict escalation had passed a threshold.

Reflection on Pak Mun MSPs

The use of MSPs around Pak Mun issues has not been studied at the level of speech-acts. Nonetheless, we know enough about them to note several striking features. Pak Mun MSPs were organized in response to ongoing distributive conflicts which had not been resolved through other political mechanisms. Consequently, they took place in a context of political pressure and uncertainty. Many stakeholders participated with the understanding that the goal was to reach decisions.

Second, the internal design and procedures of many MSPs were not ideal, when measured against norms such as equality and inclusiveness. The playing field was not level. Anti-dam villagers and their representatives resisted the participation of pro-dam villagers and their representatives. The MSPs discussed above were not designed to accommodate mass media or interested members of the public (e.g., limited or zero public notice).

That most MSPs were convened in response to, and sometimes concurrently with, ongoing demonstrations means that they took place **in the shadow of coercive power** struggles. On further analysis of discourse, we would expect to find use of sanction (threats) or use of force (e.g., manipulation by lying) (cf. Mansbridge 2009).

Third, although Pak Mun MSPs were not explicitly organized to facilitate classic *deliberation*, it is possible to detect moments of deliberation. One possible example is the President of Ubon Ratchathani University, who dramatically reversed his pro-government position on dam operations after participating in the Senate Committee MSP (Foran 2006: ch. 7). This challenges us to think about how, at the micro-level, to facilitate more deliberative moments during MSPs.

In short, Pak Mun MSPs operated in uncertain and unfavorable "external" political contexts. Their internal design frequently lapsed from prescriptions for desirable practice (cf. Dore 2007). And yet, as we have seen, they delivered both direct and – equally important – indirect outcomes.

Use of scenarios

Scenarios are stories (narratives) constructed to capture how the future might unfold. As noted above, UBU (2002) offered four options for operating Pak Mun Dam – maintaining the status quo (sluice gates closed to maximize power generation); a five-month seasonal opening; an eight-month opening; and a year-round opening for five years.

The four forward-looking options were presented in the form of a qualitative narrative of 1636 words (English version). Although the word "scenario" is not used, this text can be considered as a set of **expert-led, normative, decision support scenarios**. The scenario text drew on the findings of studies of community social relations; local farming systems; fisheries incomes; fisheries catch per unit effort during the experimental dam opening; electric power flow analysis; and a stakeholder consultation organized with local leaders (village headmen and TAO members). However, the scenarios vary with respect to one variable (dam opening and its impacts) while other uncertain drivers are treated in less detail.

The above scenarios comprised the final section of a 6900 word Executive Summary. The study team presented the Summary presented along with a set of supporting documents at a public consultation in Ubon in early September 2002, and published the final bound report in October.

Impact of scenarios

Scenarios succinctly captured a spectrum of strategies with respect to Pak Mun's future operations, and also discussed drivers such as state investment in integrated agriculture and irrigation. Arguably, they were an effective way to communicate the key findings of a long study. The fact that the UBU study itself was politicized (see 3.3.10) does not invalidate the use of scenarios as a method of communication.

Potential to improve water allocation decision making

Do any of the progressive processes and tools we are examining have **potentials** in the place to improve water allocation and decision-making?

Yes – see discussion above about pathways and importance of consensus building and deliberation.

What does the place case study teach us regarding the necessary and/or contingent conditions for a relevant process or tool to be applied and make a difference?

Analysis presented here shows how the **decision to establish MSPs** required prior mobilization and conflict escalation. The **use of scenarios** was a choice made by one knowledge broker (UBU), which entered the case on the recommendation of one MSP (the Neutral Committee).

5. Recent decision-making

5.2 Decision to delegate annual opening to provincial multi-stakeholder committee (2007)

Implementation of the dam's four-month opening policy has been far from smooth (Foran and Manorom 2009). The January 2003 cabinet resolution was followed by a five-year period in which Pak Mun's seasonal opening and closing was periodically disputed at the local level. Operating rules were not significantly elaborated. This pattern shattered in early 2007, under the military-appointed Surayud government. EGAT and its allies in the military intervened; the government reversed its operating policy. After renewed criticism it devolved detailed management responsibility to committees reporting to the provincial governor.

In April 2007, six months into the military-appointed government of PM Surayud Chulanont, three thousand pro-dam villagers (mobilized by the KVHG) rallied at provincial hall to keep the gates closed, and thus to overturn the 2004 Thaksin cabinet resolution. As well, local leaders, allegedly with the backing of the National Security Council junta and EGAT, organized a survey of 8091 lower Mun households (Assembly of the Poor 2007; Sangsok 2007). Administered by village headmen and household heads, the survey asked for the name, identification number, and signature of each household member, and for a simple yes/no response to the question of whether EGAT should store water at 106-108 a.m.s.l., (i.e., normal operating levels for power generation).

In late May 2007, on the recommendation of the Ministry of Energy, Surayud's cabinet resolved to open Pak Mun in June. But shortly after this announcement, results of the survey were presented privately to cabinet, claiming overwhelming support for dam closure from 20,592 people (8091 households). On the basis of the unpublished survey, Surayud's cabinet then reversed its earlier decision, and decided on 23 June 2007 to keep Pak Mun *closed*. This triggered another protest rally in Bangkok by the AOP. After pressure from NGOs, academics, and criticism in the broadsheet print media, the Surayud government finally resolved in July 2007 to delegate decision making about Pak Mun's opening and closing to the provincial governor.

What is the potential of the research in the place-based case in **influencing any ongoing process of decision-making** on water allocation issues? What may be the potential of the case in informing and influencing investment and/or development pathways of the place?

The research should be of interest to Ubon Ratchathani University staff, and non-academic actors open to reasoned argument about the project's history and future. However, it needs to be translated and published in Thai and disseminated. More than one version may be required to communicate with different audiences.

6. Lessons and implications

6.1 Lessons for analysts

Actors and interactions

Pak Mun offers important lessons about the necessity of mobilization by affected people. Anti-dam advocates influenced project implementation practices at Pak Mun

Dam by forming social change networks, gaining contingent recognition as new political actors. Through innovative and disruptive action, through claims for transparency and justice, through mass performances of worthiness, unity, and commitment, and through the production of local knowledge, they helped set agendas. They triggered elite intervention, as well as reactive counter-mobilization and occasional violence. The escalation of uncertainty from unintended outcomes challenged elites – aided by deliberative exchanges – to reconsider unfavourable decisions, to reconsider their preferences, and to make concessions.

At the same time, a number of events made the anti-dam movement vulnerable to destabilizing action at the local and national levels. These include: the formation of competitive (pro-dam) organizations in the lower Mun basin; complex and intractable issues (such as multiple rounds of compensation); and the inability to take credit for championing the interests of vulnerable small farmers. Destabilizing interactions occurred particularly in the restricted media space of the post-financial and economic crisis years. Populist platforms put forward Prime Minister Thaksin Shinawatra and his by *Thai Rak Thai* party pre-empted the influence of the Assembly of the Poor, the main anti-Pak Mun Dam organization.

Arenas: Ad hoc committees and the street

Because "mobilization from below" – that is, relatively weak farmers and their allies confronting the state – was a key feature of this case, many arenas did not have a formal nature. As noted above, the Thai state makes regular use of ad hoc problem-solving committees for conflict management. Problem-solving committees are usually appointed by and report to the Prime Minister or the cabinet, as opposed to parliament. This kind of institutional arrangement has several weaknesses: first, it turns decision-making about large projects into a series of "one-off" encounters. The need for a problem-solving committee depends on whether the executive branch acknowledges a problem exists, which often depends in turn upon the ability of civil society stakeholders to argue and protest that it does.

Second, by its very nature, the "one-off" settlement appeals little to rules of law. Weak stakeholders must rely upon their own and their allies' skills and resources. In certain political situations, problem-solving committees indeed deliver benefits to vulnerable stakeholders. Benefits however are highly contingent on political circumstances: stakeholders must be able to stage long-running demonstrations to press their case, which is most favourably heard when governments need to maintain flagging popularity. Receiving benefits, however, also requires convergence on shared definitions of the problem and solution.

To a certain degree, the four-month opening represents such convergence. Although the AOP officially continues to reject it, most of its membership has chosen to live with it. The complexity of issues that needed to be addressed for convergence on problem definition and solutions meant that it took a string of ad hoc committees (dating back to the Neutral Committee in 2000) to converge on the four-month opening. This is inefficient particularly with respect to future contingencies.

Neither the Neutral Committee committee nor any of Pongpol's committees specified the formal steps, procedures, and criteria by which key decisions would be made. Statements about decision-making were uniformly vague.

In 2002, the lack of a detailed decision-making timetable meant there was no institutional buffer for decision makers to resist pressure from all parties. Lack of a clear, stakeholder-accepted decision-making process led to tense lobbying for new "problem solving" committees.

Why did dam critics acquiesce in letting the Thaksin process – which left decision-making so firmly in the hands of the executive branch – proceed? After all, this coalition includes some of Thailand's most politically sophisticated civil society analysts, such as the Campaign for Popular Democracy, and of course the AOP advisors themselves. to reflect on this question. Naruemon Thabchumpon, a scholar and activist with close ties to the AOP cited three possible reasons:

(1) Power – lack of bargaining power with respect to Thaksin, who presided over the choice of committee design (notwithstanding personal ties between AOP advisors and Thaksin advisors);

(2) Institutions – entrenched administrative norms regarding the (peak) committee as an "impartial highest body" for decision making, as opposed to a multi-stakeholder forum;

(3) Strategic expectations – activists believed that in any case, further mass demonstrations would be highly likely.

(N. Thabchumpon, personal communication, 17/1/06)

This explanation displays a pragmatic rationality. However, it is one shaped by contrasting storylines: (2) reflects the obstacles civil society reformists confronted as they faced taken-for-granted institutions (bureaucratic committee as final arbiter). By contrast, the storyline in (3) reflects low expectations from those committees, and ongoing need for street politics. Both frames are "institutionalized" in modern Thai political culture.

Pathways

Pak Mun as a long-running case has offered analysts have the luxury of looking for patterns and inferring pathways, understood as distinctive combinations of drivers.

What becomes clear is, first, the sheer length of time it took to activists to achieve more just and enduring outcomes, and the emotional and economic hardship activists endured (Foran 2006). The **contingency of decision events** on drivers beyond the control of many actors also becomes clear. These included the use of violence by opponents; media coverage of activists' events (which, following conventions of news coverage, requires novelty); and the presence in government of cooperative or antagonistic elites.

6.2 Implications, challenges and opportunities

Pak Mun and Thai democratization

Pak Mun is an important case in dam decision making, one that has mobilized large numbers of supporters and opponents, and contributed to the re-shaping of state–society relations in Thailand. A dam planned and implemented with low transparency and accountability helped trigger an unfolding, emergent series of disputes. Disputes over Pak Mun helped democratize an authoritarian state. The movement against Pak Mun has helped socialize Thai society to tolerate, and participate in, vigorous street demonstrations. It helped opened up new spaces for livelihood and environmental politics: on campuses, in the media, and—when routine politics fails ordinary people, as it often does in Thailand—on the street.

Politics of knowledge

Pak Mun offers sobering lessons about politics of knowledge. Sustained production of knowledge for dispute resolution (e.g., the WCD study) occurred relatively late in the case, and late in particular cycles of contention (Figure 2). This meant that knowledge production did not always contribute in a 'rational' way to informed negotiation. New knowledge could instead trigger reactive framing, as for example when Thaksin's advisors disputed the findings of Ubon Ratchathani University (2002) and ordered an opinion poll. Concepts such as dependable capacity, occupation, fisher, and farmer were contested by laypeople and by experts using different methodologies. Contending research sponsors required simple conclusions on key issues such as the importance of wild-capture fisheries to local livelihoods. They ignored the nuances of smallholder livelihood strategies. With authority highly concentrated in the state's executive branch, knowledge production was manipulated. The 'politics of knowledge' thus should not be abstracted from the politics of blame, threat, and other forms of contention present in a particular dispute (McAdam, et al, 2001; Foran, 2006: 6).

Global and regional ramifications

Analysts and advocates for affected people—not just in Thailand, but as a result of Pak Mun's international prominence—have learnt to question all project studies from its inception—-the fundamental need for the project—and extending to its ramifying impacts (World Commission on Dams, 2000). Civil society actors have learnt to mobilize, often in cross-scale coalitions, and to re-politicize knowledge and capture public arenas of deliberation by undertaking, compiling and publishing their own data and research.

After twenty years of debate over Pak Mun, some infrastructure sponsors (such as World Bank) have learned to approach complex questions of livelihoods restoration with more humility. On the other hand, Thai water and hydropower developers such as EGAT, its subsidiaries, and associated civil engineering and consulting firms have been compelled to move to neighboring countries such as Lao PDR or Myanmar/Burma to build projects they continue to promote as preferred solutions to Thailand's needs.

Far from disappearing under agricultural modernization, Pak Mun shows that dependence on wild-capture aquatic resources persists. This important finding from relatively 'modern' Thailand implies hydropower development will lead to even stronger negative impacts for small farmers elsewhere in the Mekong region. With national economic development as the over-riding priority, rural people face a spate of large new water proposals, wrapped in powerful discourses of modernization and poverty alleviation.

Pathways to improved decision making?

In practical terms, how might reformists encourage better decision making? Reforming water and energy governance challenges power interests and institutions, so advocates will encounter repressive counter-framing. Collective action will be met with counter-mobilization, elite intervention, and rejection of substantive negotiation and discussion. Advocates of improved governance and sustainability could nonetheless promote particular combinations of processes. One idea is to promote processes that are scientifically credible, legitimate to different stakeholders, while savvy about the many faces of power.

Further research needs

By late 2009 we received reports that provincial-level management initiated in 2007 was not delivering outcomes deemed significant to the AOP. In September 2009, the AOP held a rally to demand demanding that the government of PM Abhisit Vejchachiva fully open the dam gates, apparently based on new analysis of the dam's electricity generation costs. At the same time, the AOP acknowledged that the twenty-year old conflict had taken its toll on some leaders, who had withdrawn from the organization or switched their support to EGAT (*Samnak Khao Prachatham* 2009). In 2010, under the government of PM Abhisit Vejjajiva, the affected peoples' search for livelihood restitution reverted to a national-level committee.

Foran and Manorom (2009) argued that the success of any conflict management initiative at Pak Mun will hinge on stakeholders' ability to agree on and formalize decision making processes. Otherwise, they argued, concessions such as the seasonal opening can be withdrawn. For any operational policy at Pak Mun to work, it also needs to be presented and run as an experiment aimed at delivering meaningful livelihood outcomes to supporters and opponents alike. If not, both factions—which claim to represent poor farmers—will abandon it in favour of prior understandings.

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Improving hydropower development? The Case of the Nam Ngum 5 Hydropower Project in Lao PDR

Yu Yin and Kate Lazarus

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Introduction

The Nam Ngum River Basin (NNRB) is considered by many to be the most important river basin in Laos. It contributes over 10% of the country's total water flow into the Mekong River, accounts for 34% of Laos' total dry season rice production, and supports the largest reservoir and oldest hydropower scheme, the Nam Ngum 1, in the country. There are more than nine hydropower projects planned in the basin with development and investment occurring from a number of different sources including the private sector and the Asian Development Bank (ADB).

This study focuses on the Nam Ngum 5 Hydropower Project and the decision by a Chinese company, Sinohydro, to gain approval for political risk insurance from the Multilateral Investment Guarantee Agency (MIGA) of the World Bank Group. This chapter first discusses the key water-related development and management issues in the Nam Ngum River Basin, and then through a frame of China's *Going Global Strategy* in search for natural resources aboard. We then explore the background and role of China's leading engineering and construction company, Sinohydro, in hydropower development in Laos followed by its decision-making process and collaboration with MIGA. In particular, ours research aims to dissect the actual driving force and decision-making process within Sinohydro that led the company to seek collaboration with MIGA on the Nam Ngum 5 project. We also aim to understand what implications this decision has on future investments by the company in large hydropower projects in the Mekong Region.

Hydropower Development in Laos

Laos is a mountainous and land-linked country in the Mekong Region. The section of the Mekong River in Laos is 1900 kilometres long, one-third of the entire length of the River. Laos comprises of 202,000 square kilometres of the Mekong River basin, which is 25% of the total basin catchment, and 85% of the Lao territory. The Mekong's tributaries in Laos contribute to 35% of the river's annual flow. The population of Laos is estimated at 6.8 million with the majority of people living in lowland areas and along the river valley. Its economic sources are mainly from agriculture, logging, mining and hydropower. The estimated GDP in 2008 was $5.2 billion and per capital income estimated at $765 (USUSPD 2009).

The development agenda of the current Lao government has moved from a planned economy to market liberalization, following the call of "changing the battle field to a market place" (Watershed 2001). In the late 1980s, the World Bank, Asian Development Bank (ADB), United Nations Development Programme (UNDP) and other bilateral donors pushed for the Government of Laos to use concessional loans, bilateral aid and Build-Operate-Transfer (BOT) contractual arrangements with the private sector to develop hydropower for domestic use and export. Due to Laos' mountainous topography and vast water resources coupled with the rapid economic growth and hunger for energy by Thailand, the Government of Laos has committed itself to support countless hydropower projects. Most of these projects have attracted numerous foreign investors. By the end of 2008, 10 hydropower projects with an installed capacity of 667 MW are operating, 8 projects with installed capacity of 2,530 MW are under construction, and over 60 projects are currently in the planning and feasibility stages. These projects are expected to generate over 20,000MW (GOL/MEM 2009). All of these efforts have resulted in a strong prioritisation of hydropower development making Laos the "battery of the Southeast Asia".

Despite the prioritization of hydropower development reports indicate that the impacts from hydropower dam construction and operation have continued to contribute to poverty in rural communities who live around dam reservoirs and along rivers, through involuntary resettlement, food insecurity, insufficient clean water and loss of livelihoods (International Rivers 2003; Wong 2003; Lawrence and Campello 2008).[1]

The Nam Ngum River Basin

The Nam Ngum River Basin (NNRB) is the fifth largest river basin in Laos. The basin covers a large area in north-central Laos, cutting across the administrative borders of Vientiane Province, Vientiane Municipality, Xieng Khouang Province and small parts of Luang Prabang and Bolikhamxay Provinces. In 2006, the Xaisomboon

[1] See Hirsch (1998) the Nam Ngum 1 Dam, which was the first dam to block the Nam Ngum River, an important fish migration route to and from the Mekong River. See Watson and Schouten (2001) and Middleton (2009) re the Nam Song Diversion Project and the Nam Leuk Dam and the impact to fisherman and local villages. See reports on the Nam Theun 2 project and the way in which better environmental and social safeguards have been implemented to move towards improving the way in which projects are developed in Laos.

Special Zone, which is also part of the NNRB, was dissolved, and most of its districts added to Vientiane Province (Lawrence et al, 2008).

The NNRB is home to almost 10% of the Lao population including some of its poorest communities, mainly ethnic minorities in the middle and upper reaches of the basin. About 40% of the population reports annual rice shortages of four months or longer, and more than 65% lives below the poverty line. The population is approximately 70% ethnic Lao-Tai, 18% Hmong/Iu-Hmien, and 10% Khmu.

The NNRB is rich in mineral resources, with 39 mines operating officially and a total of 6,000 square kilometres of approved mining concessions as of 2006 (Lawrence et al, 2008). The largest of these mines is the Phu Bia Gold mine operated by Pan Australia Resources, which began production at the end of 2005 (Lawrence et al, 2008).

The NNRB is considered by many to be the most important river basin in Laos, contributing over 10% of the country's total water flow into the Mekong River, accounting for 34% of Laos' total dry season rice production, and supporting the largest reservoir and oldest hydropower scheme, Nam Ngum 1(completed in 1971) in the country. The Nam Ngum 2 Dam is under construction, and up to nine others have either started construction or are proposed for development.

Figure 1: Location of Nam Ngum River Basin in Lao PDR (Source: Nam Ngum River Basin Development Sector Project, (ADB 2002)

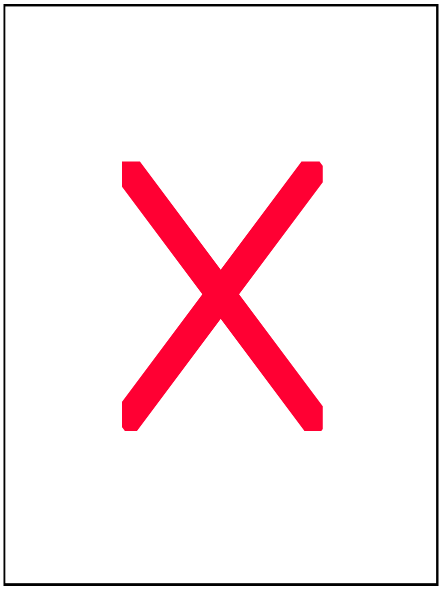


Figure 2: Location of Nam Ngum 5 Hydropower Project within the Nam Ngum River Basin (Source: Lawrence et al 2008).

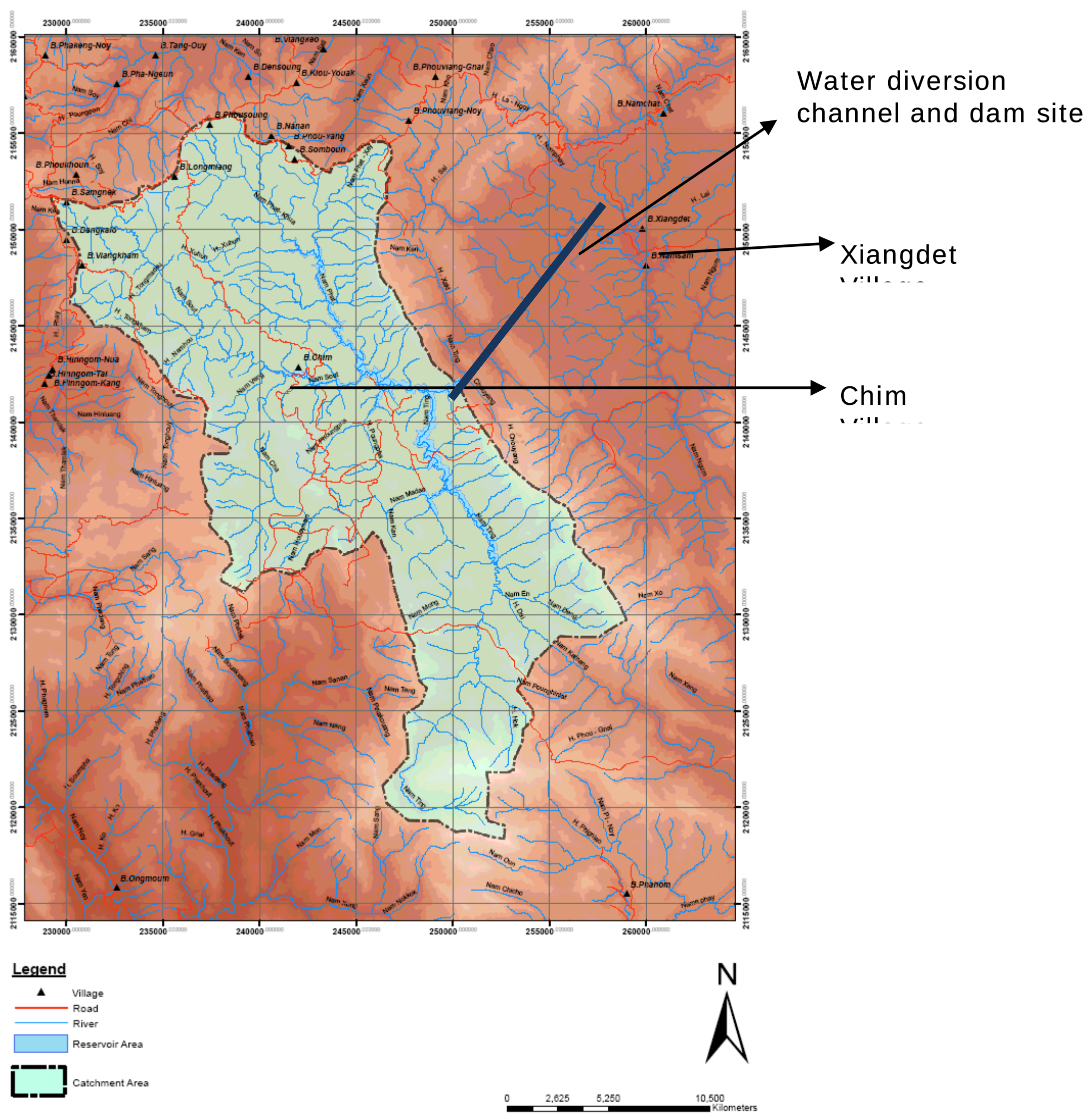
The Nam Ngum 5 Hydropower Project

The Nam Ngum 5 (NN5) Hydropower Project is a relatively small dam with an estimated 120 MW generating capacity. The dam is currently under construction in the NNR basin. The dam is located in the Nam Ting River, a tributary of the Nam Ngum River in Phoukhoum District, Luang Prabang province, upstream of the Nam Ngum 3 and the Nam Ngum 2 and approximately 300 km north of Vientiane. This 104.5 meter high dam would flood an area of nearly 15 square kilometres(Lao Consulting Group, 2009).The dam will mainly impact two villages: Ban Chim and Ban Xiangdet, located in the upstream and downstream respectively.

Ban Chim Village is in Luang Prabang Province, Phoukhoum District about 35 km from Phoukhoum District Centre. The village is located along the hillside above the Nam Sout valley at an elevation of 1,500 metres above sea level. The village was founded in 2000 as one of the strategic development zones of Phoukhoum District. The village has 172 households and a total population of 1,333 people. Whilst the impacts from the project are not perceived to be at a large scale, the most tangible impact projected will be from flooding of the rice field with the possibility of blocking road access to the forest and grassland. At least two households will need to be resettled and many households will need to find new areas for cultivating rice or alternative livelihoods. Villagers will be impacted at different degrees, for instance, some villagers will face difficulty in fishing contributing to a loss of important protein sources whilst others will have difficulty in facilitating livestock to the grazing lands or access to the forest for non-timber forest products collection (Lao Consulting Group, 2009).

Ban Xiangdet Village is located downstream of the dam site on the boundary of NN5 hydropower project and Nam Ngum 3 (NN3) hydropower projects. This village is situated within the Nam Ngum 3 dam reservoir area and has been notified as one of the resettlement villages. Given that the NN3 project is not underway, Ban Xiangdet is currently being impacted in a couple of ways. There has been a reduction in stream flow to the village, some pollution causing a deterioration of water quality leading to loss of fishery catches. Ban Xiangdet Village was not included in the NN5 Environmental and Social Impact Assessment, and the Livelihood Restoration Plan due to the fact that the village will be resettled once the NN3 project gets underway. Nevertheless, the Village Head has reported to the local government authority concerns about water pollution impacts from dam construction, and the NN5 Hydropower Company has evaluated the situation and constructed a new water channel and possibly a water pump ((Nam Ngum 5 Power Company Ltd 2009).

Figure 3: Nam Ngum 5 Hydropower Project Area



Source: Lao Consulting Group, 2009[2]

China's Overseas Investments in the Mekong Region

China is establishing itself as an economic powerhouse around the world. Its economic rise and consequent demand for a reliable and steady supply of inexpensive natural resources have led to a rapid increase in Chinese foreign direct investment (FDI) in Asia, Africa and Latin America. China's Tenth Five-Year Plan for National Economic and Social Development (2001-2005) set out a strategy for China to proactively make use of overseas natural resources. Since 2004, the country's *Going Global* (or Going Out) *Strategy* specifically intends to meet its growing demand

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[2] The notification of the water diversion channel and dam site is not in the actual scale. It is merely based on interview information.

for natural resources, both regionally as well as globally, and spur outward investment by subsidising investment by Chinese companies in overseas natural resources acquisition. The strategy and its related initiatives include the promulgation of guidelines on outward FDI by countries and sectors, delegation of authority by the central government to certain provinces and municipalities and further relaxation of foreign exchange controls for outward investment (Rutherford et al, 2009).

China's relationship with the Mekong Region and in particular with Laos is dynamic and complex. Relations have never been so good. Border issues are handled peacefully, eclipsed by economic interests. The close proximity of the two countries eases trade flows as infrastructure improvements are connecting major regional cities and borders are open for business through international gates (Rutherford et al, 2009). Trade and investment are increasing among the two countries.

In recent years, the Mekong Region countries have seen the partial withdrawal of International Financial Institutions (IFIs) such as the World Bank and the Asian Development Bank (ADB), which have become hesitant to invest in environmentally and socially controversial mega-projects. Furthermore, in recent years the IFIs have developed international standards and best practices for investment in projects with potentially large social and environmental impacts, such as hydropower. These standards are often criticised by host governments as being onerous and cumbersome and it can take years for projects to get approved. This has left an investment vacuum that has been gradually filled by largely Asian financiers, and has enabled 'new financiers' such as Chinese companies to take advantage of the favourable investment climate and abundance of natural resources of its immediate neighbours, including Laos (Rutherford et al, 2009).

Box: Who is SASAC?

Under the State Council, the State-owned Assets Supervision and Administration Commission (SASAC) was formed to oversee and guide a total of 171 state enterprises. SASAC has three main functions and responsibilities. 1. *Reform and corporatisation*: it acts to guide and promote the reform and restructuring process of state-owned enterprises; to ensure the value of these state-owned assets keeps enhancing; and to improve the corporate governance and navigate the strategic adjustment of the state economic structure. 2. *Personnel selection*: SASAC can appoint and remove top executives of these enterprises, or grant rewards or inflict punishments based on their performance evaluation. 3. *Legal administration*: SASAC can draft laws and administrative regulations to regulate the management system of the supervised state-enterprises.

Who is the Sinohydro?

The Sinohydro Corporation[3], the largest hydropower dam building company in China, is developing and beginning to expand its operations via investment in numerous hydropower projects in Laos. Sinohydro is a key state enterprise in infrastructure construction in China with over 130,000 employees (Sinohydro Corporation, 2009). It operates directly under the State-owned Assets Supervision and Administration Commission (SASAC see Box), with a

[3] Sinohydro Corporation is the controlling company of its subsidiaries and holding companies, while Sinohydro Corporation Limited is one of the subsidiaries, which is responsible for all of the Sinohydro Corporation's international business.

registered capital of 4,000 million yuan (USD580) and total assets of 52,200 million yuan (USD$7,680) (ibid).The main business of Sinohydro is hydropower and hydraulic construction, and the company has currently expanded to activities around investment, project financing, consultation services and transport infrastructure construction, such as roads and harbours. The corporation currently has 17 wholly owned subsidiaries and 10 holding companies nationwide, and 33 overseas branch companies and representative offices in Asia, Africa, Europe and America. Its main overseas business focus is in Africa (56%) and Asia (43%) (Sinohydro, 2009a). The status of China's structural reform of its power sector will enable a better understanding of the rationale behind its overseas investments.

The Sinohydro Corporation was formerly called the China Water Resources & Hydropower Engineering Corporation (CWHEC), and established in 1988. It was under the supervision of the Ministry of Energy and Ministry of Water Resources until 1993 and later transferred under the Ministry of Power and Industry and then under the National Electricity Corporation. During that time, the corporation was a wholly state controlled enterprise entity, which colligated 19 units as members responsible for hydraulics and hydropower construction to development nationwide.

The structural reform of China's power sector, which started in the last two decades, aims to gradually transform state-owned electricity-related enterprises, such as Sinohydro, from a planned economy, where construction is based on government plans and staff are guaranteed with lifetime employment, towards a market-oriented and competitive international corporation under the supervision of SASAC in terms of assets, finance, and top personnel management.

The formation of the Sinohydro Holdings Corporation is one of the key outcomes of the national energy sector reform and restructuring in the early 2000s. The aim of the re-organisation and re-assembly of its member bureaus was to build up the competitiveness of the corporation in the national and global market. Meanwhile it undertook the responsibility to corporatize the member organisations with modern business management systems and mechanisms to ensure they operate under the legal protection of the Company Act of 2002.[4]

These reforms symbolised the transformation of wholly state controlled enterprises to a move towards the "state- controlled corporatisation" (Guo Fa 2002)). Sinohydro is no longer in a position to wait for government assignments, but has to seek and compete for infrastructure projects, in search for opportunities to diversify the business risks and explore the long-term investments in both the national and international markets. For instance, Sinohydro has engaged in various large-scale hydropower and highway constructions in both Africa and Asia since 2000, and has started to explore long-term 'build, operate and transfer' (BOT) investment arrangement in Laos and Cambodia since 2004. (Sinohydro, 2009a)

Nevertheless, the control of the Chinese government over state enterprises, such as Sinohydro, has not loosened. A government document on Sinohydro Corporation Reform stated that the corporation is still managed by the central government and that all key leaders will be appointed by the central government; its asset and financial management will lie with the Ministry of Finance; and the supervisory panel from SASAC will be dispatched to monitor the preservation and increment of their assets (Guo Fa, 2002).

[4] http://eng.sinohydro.com/en/idems/History.asp

The reform and restructuring of state enterprises has enabled most enterprises, such as Sinohydro to gain several competitive advantages in overseas investment over average private enterprises. First of all, these state enterprises are mostly re-assembled from various governmental construction departments and research institutions located nationwide, thus the powerful business networks and a batch of experienced human resources already exist. Therefore they are most likely to win the tender or to be assigned Chinese overseas aid infrastructure projects, especially road and hydropower projects. Secondly, they are the pioneers of China's "Going Global" policy and with these favourable policies enterprises have more chances to obtain funding from different national development banks. Thirdly, they can approach decision-makers of host governments easily, as often their projects bring additional diplomatic value on top of the economic benefits, so their bargaining power for bearing the project costs with the host government is higher. Finally, these projects often present themselves as projects that will bring development and prosperity to the host countries, yet often ignore the mitigation measures and the negative impacts on the local people.

Sinohydro's foreign investments and related social issues

With steps of state enterprise reform and restructuring, the Sinohydro Corporation registered its international business department as the Sinohydro Corporation Limited, a legal subsidiary entity that focuses on developing its international business. The corporation holds foreign business licenses from the government, assumes the management of all existing international construction projects of its member companies, and is exploring new international projects and investments. Sinohydro Corporation Limited has been involved in over 100 construction projects in more than 30 countries across Asia, Africa and Latin America, with contracts valued at 900 million USD(Sinohydro Corporation Limited 2009).

Since the 1980s, Sinohydro has benefited from the government's foreign aid projects. These projects have assisted the corporation in accumulating experience and developing overseas business relationships. The increase in Sinohydro's member organisations moving to privately search for overseas construction businesses set off around 1997 when there was a downturn in hydropower construction in China due to the prioritisation of the limited national budget for the Three Gorges Dam construction. Many governmental hydraulics and hydroelectricity engineering institutions were unable to obtain domestic construction projects which forced them to seek construction opportunities aboard. However, in order to make foreign business contracts or investments abroad, companies needed a foreign business license from the Ministry of Commerce, which again limited these organisations' business. However, a way to manoeuvre around this issue was by cooperating with and obtaining contracts from other state enterprises such as the China International Water and Electric Corporation (CWE)[5]. Thus, the "window" for obtaining construction contracts became essentially important. As a result, Sinohydro's member bureaus, in most construction projects, is merely as a sub-contractor that only has an obligation to finish contract requirements, but takes no responsibilities for the negative impacts to the people and local environment as a result of a projects development and implementation.

[5] CWE is one of the first few state-owned corporations approved by China State Council to undertake international contracting projects. Its activities focus in international contracting, foreign economic aid, international trading and manpower export. It is also one of the key state enterprises under the supervision of SASAC. http://www.cwe.com.cn/en/BriefIntroduction/BriefIntroduction.html

This situation changed in 2004 when Sinohydro tactically planned to expand its business scope to different fields, including road construction, port development, and mining, among others and to focus toward longer term investment projects namely Build, Operate and Transfer (BOT) projects. The first BOT projects are located in Southeast Asia; the Kamchay Dam in Cambodia in 2007 and NN5 Dam in Laos in 2008, both of which are under construction.

Sinohydro's Investment in Laos

The Sinohydro Corporation started investing in Laos in 1997 and the Nam Leuk Dam became its first project. The project was funded by the Asian Development Bank and Japanese government and contracted through CWE. Later through CWE, Sinohydro obtained construction contracts for the Nam Mang 3 Dam, Xeset 2 Dam and Nam Lik 1-2 Dam. According to International Rivers, the Nam Mang 3 project affected an estimated 15,000 people, including 2,700 people who had to be resettled from the reservoir area. Today, the Nam Mang 3 is not in operation year round due to low water levels. To date Sinohydro has been involved in nine hydropower dams, of which six dam projects are only for construction, and the other three are BOT projects. In addition, to diversify the risk of investments in Laos, Sinohydro bought one cement factory and initiated a Potash Manufacturing Company (see Table 1). The expansion from hydropower construction to hydropower investments and a further diversification of investments will facilitate Sinohydro to accumulate long-term revenues instead of short-term profits. Moreover, the long-term working relationship between Sinohydro and Electricity duLaos (EDL) along with other relevant government agencies has already built a base for their long-term investment.

Table 1: Sinohydro Projects in Laos

Project	Installed Capacity (MW)	Status	Developer	Contractor	Financer	Market
Nam Leuk Dam	60	Operational since 2000	EdL	Sinohydro	ADB and Japanese government	Laos/Thailand
Nam Mang 3 Dam	40	Operational since 2004	EdL/CWE	Sinohydro	China EXIM Bank	Laos/Thailand
Xeset 2 Dam	76	Under construction completion expected by August 2009	EdL	Sinohydro	China EXIM Bank (80%)	Laos/Thailand (20%) and Cambodia via a new transmission line supported by the WB
Nam Lik 1-2 Dam	100	BOT Under construction completion expected	CWE (80%), EdL (20%)	Sinohydro		Laos

		by May 2010				
Nam Ngum 5 Dam	120	Under constructio n completion expected by 2011	Sinohydro (85%), EdL (15%)	Sinohydro	China EXIM Bank (not confirmed)	Laos
Nam Ou Cascade Dam	1100	Dam survey and design stage	Sinohydro	Sinohydro	Unknown	
Pak Lay Dam	1320	Dam survey and design and feasibility studies stage	Sinohydro/ CEIEC	Sinohydro	Unknown	Laos/Thailan d
Nam Khan 26	130,000 kW	Constructio n Contract	EdL	Sinohydro	Unknown	
Nam Khan 3	47,000 kW	Constructio n contract	EdL	Sinohydro	Unknown	
230 kV transmiss ion line Xiengkho uang to Luang Prabang city		EPC Contract	EdL	Sinohydro	Unknown	
Cement factory		Operational	Sinohydro	acquisitio n		
Potash Mining		Under Constructio n	Sinohydro	Sinohydro		

The Sinohydro Corporation in Laos has several different offices, which includes the representative office, the NN5 Power Company, Sinohydro Bureau Ten and Fifteen, the Cement Company and the Sinohydro Potash Mining Company. The representative office acts as a gateway of communication for potential foreign projects to headquarters and general monitoring of its subsidiary companies. The NN5 Power

[6] Nam Khan 2 and 3 Dam and 203 kV 230-kV power transmission line from Xiengkhouang to Luang Prabang city, was signed August 2009 in Beijing.
http://english.people.com.cn/90001/90778/90857/90861/6727902.html

Company is a joint venture company with EdL and its staff comprise of representatives from Sinohydro Corporation Limited (the Corporation's International Department), Sinohydro Bureau Ten and from EdL. This office acts as the project owner of the NN5 Dam, and meanwhile seeks and prepares for other new projects including the Nam Ou Cascade Dam Development and Pak Lay Dam along the mainstream of the Mekong River. Sinohydro Bureaus Ten and Fifteen mostly conduct civil engineering and construction work. The Sinohydro Bureau Ten was sub-contracted in the construction of the Nam Leuk Dam, Nam Mang 3 Dam, Xeset 2 Dam and Nam Lik 1-2 Dam and now the NN5 Dam ((Sinohydro Bureau Ten 2009). The Sinohydro Bureau Fifteen is new in the region, and is currently involved together with Bureau Ten in the NN5 Dam construction. The two non-hydropower businesses, the cement factory and Potash Mining, are operated independently with staff from Sinohydro Corporation Limited. All these companies are at the same level under the umbrella of the Sinohydro Corporation (see Figure 4). They operate independently but are also closely connected.

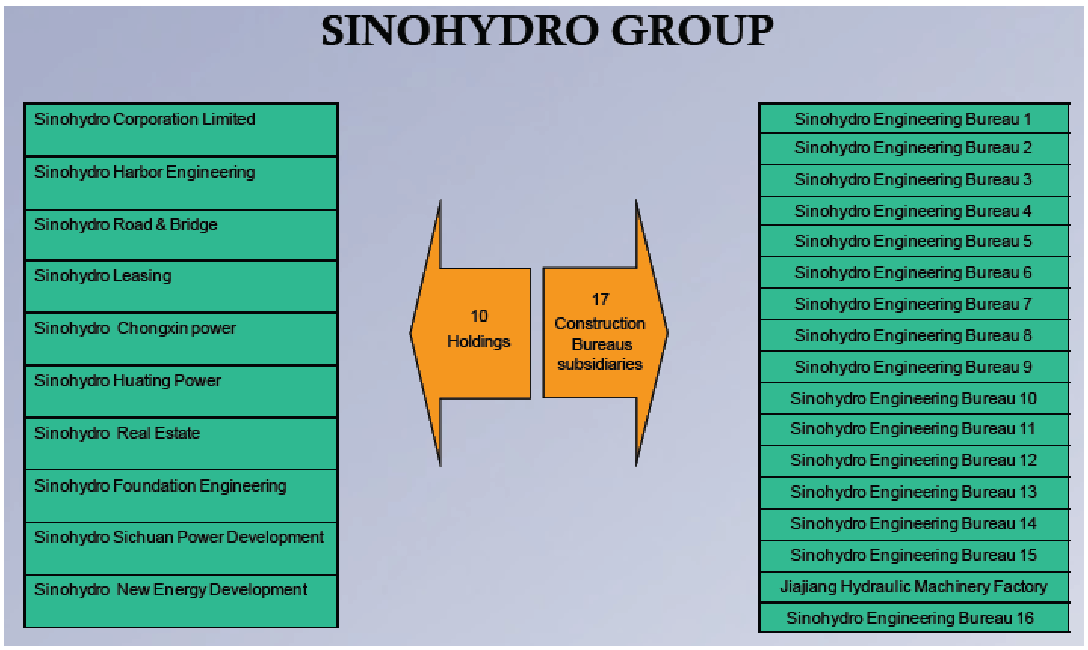

Figure 4: Sinohydro Corporation Organizational Diagram (Sinohydro Corporation 2009 a).

Sinohydro's Build, Invest and Operate (BOT) investment in the Nam Ngum 5 Dam

The responsibilities and risks for associated foreign investment, such as BOT hydropower projects, are much more complicated and diverse compared to simply dam construction projects. Sinohydro, with extensive experience in hydropower construction, has had to gain experience in hydropower investment and long-term development. Hence, their strategy in foreign investment is very cautious, beginning with smaller-scale hydropower investment that may have less negative impacts followed by larger-scale and more controversial hydropower development with more anticipated positive and negative impacts. Therefore, in Laos, Sinohydro strategically planned to start with the smaller projects such as theNN5Dam, and while continuing with the NN5 Dam construction and operation, they can expand to the more controversial Nam Ou cascade of dams project and the Pak Lay project, which are much more extensive in terms of their size and environmental and social impacts.

The NN5 Hydropower project was listed as one of the 20 shortlisted National Hydropower Projects that the Government of Lao plans to build. The pre-feasibility study of this project was conducted by Lahmeyer International (Germany) and Energy Equity Corporation LTD (Australia) in 1997 (Donsay Company Ltd 2007). After several meetings and negotiations with the Ministry of Planning and Investment, the MOU between Sinohydro and the Government of Laos was signed in March 16, 2004. Dongsay Company Ltd[7] was commissioned to carry out the Initial Environmental Examination (IEE) between May to June 2005. The detailed study for the Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Environmental Management Plan (EMP) and Social Action Plan (SAP) was carried out after the IEE approval. The Water Resources and Environment Administration (WREA) approved these documents in June 2008. The background information of the NN5 power project and project progress are shown in Tables 2 and 3.

Table 2: NN5 Hydropower Project Background in brief

Location	(Administrative) Approximately 300 km north of Vientiane Dam area: Phoukhoun District in Luang Prabang province Power house: Phoukout District in Xieng Khouang province (Watershed) Upstream of Nam Ting basin, sub-basin of the Nam Ngum river basin Dam area: Nam Phat, Nam Soud and Nam Ting River. Power house: Nam Ting River
Construction feature	Rollere Compacted Concrete Dam of 104m high and 258m long crest Headrace tunnel: 8.6 km and Penstock: 1.2 km Construction period 4 years, expected to completed in 2011
Electricity generation	Installed capacity of powerhouse is 120-Mega Watt (MW) Expected annual power generation is 507 GWh
Dam reservoir	Estimated Reservoir surface area is 15 km^2 Estimated gross reservoir storage is 314 Mm3
Main stakeholders	Developer: Sinohydro Corporation Ltd 85%, EdL 15% Financial: China EXIM Bank (Currently under negotiation) Contractor: Sinohydro Bureau 10 and Bureau 15 Project Management Company: Proposed Political Risk Insurance Agency: MIGA (Approval not yet in place) S/EIA Consultant Company: Dongsay Company Ltd (disbanded) Consultant Company for Livelihood Restoration Plan: Lao Consultant Group Ltd and follow-up implementation of LRP: Earth Systems Lao
Impacted community	Ban Chim Village (upstream of dam site): Around170 households will be impacted Ban Xiangdet Village (downstream of dam site): A village impacted by the Nam Ngum 3 dam which will require resettlement.

Source: NN5 Hydropower Project: Update of Environmental Impact Assessment, Dongsay Company Ltd, 2007; Livelihood Restoration Plan, LCG, 2009; and interviews with NN5 Company staff

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[7] Dongsay Company Ltd was a Lao local consultant firm for infrastructure construction. Its activities covered Environmental Social Impact studies and data collection, engineering (roads, water supply, sanitation) irrigation, land surveys, building and architecture consulting services.

http://www.spraci.com/boards.php?task=show&id=94480&board=x0laos&username=&area=x0laos&ucode=&parea=x0laos

The NN5hydropower investment and development procedures are summarised into four phases: project negotiation and agreement, project research and disclosure, MIGA and external financing procedures and project construction. The four phases often overlap or are conducted concurrently. By doing so, it has enabled Sinohydro to move through the process faster, whilst having to bear various kinds of contingent risks. The Lao government approved construction of the project in June 2009, although preparation for construction preparation had already started as early as end of 2008. By August 2009, the construction of the project road, workers' campsites and associated facilities were completed. The construction of the foundation for dam structure and excavations for water diversion channels are under way. However, the formation of the Social and Environmental Management Unit (SEMU), MIGA political insurance approval and NN5 financing have not yet been finalised.

Table 3: NN5 Hydropower Project Approval Process

Year	Project Negotiation and Agreement	Project Research and Disclosure	MIGA and External Financing Procedures	Project Construction
2004	March 16, MOU signed	April, Feasibility Studies[8] started		
2005		April, IEE[2] started		
2006	February 25, Project Development Agreement	March, IEE Approved and continued with S/EIA, EMP, and SAP[9]	January, started initial contact with MIGA for obtaining political risk insurance	
2007	April 11, CA and PPA signed[10] May, NN 5 Power Company established and SA[11] signed	August, Provincial EIA Workshop in Phoukhoun District	January, Definitive application approved. Oct 24 to 26, MIGA visit to the NN5 project site	
2008	June 23, Environmental Certificates awarded by GOL	March, National meeting on EIA, in Vientiane, Lao PDR June, S/EIA approved by WREA September, Final	July, MIGA sponsored research to develop Livelihoods Restoration Plan August 1, NN5 stakeholder meeting (MIGA/The World Bank) November, China EXIM	August 31, Sinohydro Ltd and Sinohydro Bureau 10 signed contract for dam site construction Sinohydro Ltd signed contract with Sinohydro Bureau 15 for power house construction

[8] Feasibility Studies were conducted by the Sinohydro No 14 Engineering Bureau. The dam investigation was conducted in 2004 and dam design took longer for adjustments until final official approval in September 2008.

[9] Initial Environmental Evaluation (IEE), Social Environmental Impact Assessment (S/EIA), Environmental Management Plan (EMP), and Social Action Plan (SAP) were all conducted by Dongsay Consultant Company Ltd and were submitted to WREA for approval in March 2008. The Environmental Certificate was awarded in June 2008.

[10] The Concession Agreement (CA) and Power Purchase Agreement (PPA) were signed with the Energy Promotion and Development Department and EdL respectably.

[11] The Shareholder Agreement (SA) was signed with EdL indicating that Sinohydro has 85% of the share and EdL has 15% of the share.

		Feasibility Study Approved	Bank visit for review of due diligence	
2009	November, National Assembly approval		July – MIGA field visit	
2010		January, disclose the general information on Sinohydro website	Livelihood Restoration Plan in final draft (unlikely to be formally finalised). Earth Systems Lao hired to implement Livelihood Plan February – MIGA field visit	

Financing the Nam Ngum 5 Hydropower Project

The investment cost of the NN5 hydropower project is estimated at $200 million USD. This massive amount of investment cost requires strong and stable financial support and risk minimisation. Sinohydro originally approached the China Export and Import Bank (China Exim Bank) and ANZ. ANZ is an Equator Bank[12]and due to the vigorous social and environmental requirements, and implementation cost, Sinohydro decided to apply for financing from the China EXIM Bank.

Box: China EXIM Bank's Environmental Guidelines

The China EXIM Bank has recently started to become more aware of the risks of overseas infrastructure projects and its reputation. In August 2007, the Bank issued "Guidelines for Environmental and Social Impact Assessments of the China Export and Import Bank's Loan Projects". These guidelines require the borrower to carryout an environmental and social impact assessment and uphold the host government's policy and standards, respect local people's rights to land and resources and properly handle any resettlement problems, and openly consult the public for projects that will have serious negative environmental impacts (China EXIM Bank 2007). However, this policy is neither displayed on the China EXIM Bank website, nor known by its lender. The announcement could only be accessed from a few international NGOs' websites(Peter Bosshard 2008) and(Chan-Fishel 2008).

Sinohydro approached China EXIM Bank as the financing agency for a loan up to 70% of the total investment cost (approximately $140 million USD). Amid all the requirements for the loan, risk minimisation is the priority. China EXIM Bank could offer a lower interest rate and administrative fee provided that all the insurance guarantee certificates and assurance documents by the Lao government are approved and submitted before the loan is released. Apart from all normal business risk insurances, the political risk insurance has become one of the required insurance formalities for long-term investment projects by the China EXIM Bank. China EXIM Bank officials carried out a due diligence visit to the NN5 project site in November 2008. The Bank has informally agreed to provide funding provided the submission of

[12] The Equator Banks are those that have endorsed the Equator Principles, which is a financial industry benchmark for determining, assessing and managing social and environmental risks in project financing. See www.equator-principles.com.

all required documents. Currently, the China EXIM Bank, Sinohydro and MIGA are discussing further detailed contracts regarding the terms of responsibility, insurance coverage and other relevant issues. As of early 2010, funding has not yet been secured because Sinohydro has not received approval from MIGA. Currently Sinohydro is using its own finances to fund the project construction and development, a much riskier mode of operation but one that enables the corporation to move forward whilst manoeuvring through the approvals process.

Potential opportunities for improving the environment and social aspects of the Nam Ngum 5 Project

Political risk refers to the risk of a strategic, financial, or personnel loss of a company due to nonmarket factors such as macroeconomic and social policies, such as fiscal, monetary, trade, investment, industrial, income, labour, and developmental; or events related to political instability, for instance, terrorism, riots, coups, civil war, and insurrection(Kennedy 1988). NN5 is a 25-year BOT hydropower project. Within the 25 years, the revenues generated approximately in the first ten years will be used for loan repayment while only the revenue generated for the remaining 15 years will belong to the NN5 Company Ltd, a joint venture between Sinohydro and EdL. Thus, the investment is exposed to unknown and uncoverable political risks. The Lao government offers this investment opportunity for economics and politics. Economically, the project will increase electricity supply in the northern part of Laos for investments and development such as mining, and income generation for the Lao government through taxation and 15% of company’s shares. Politically, the area is well known for ethnic insurgents and the floodplain may be used to tighten the space for any ethnic insurgents. The project is located in a very isolated mountain range, which shares a border with a politically sensitive zone, and some of the impacted villages are ethnic minorities who have historical conflicts with the current government. Along with the anticipated high investment returns are the looming political risks, which Sinohydro is cautious about. Since the project started, the company has had to employ several soldiers to guard the project’s entrance, the worker’s camp and along the road construction.

The selection of political risk insurance agencies is an important task and an evaluation and decision was made by Sinohydro in the early stages of the project. There are two options available for the company, the Multilateral Investment Guarantee Agency (MIGA) and the China Export & Credit Insurance Corporation (Sinosure). The former is an international agency dealing particularly with political risk of foreign investment for the last 20 years, and the latter is a Chinese national enterprise with its main focus on international trade related insurances operating since early 2000. The comparison of these entities is shown in Table 4.

Box: Who is MIGA?

MIGA is a member of the World Bank Group that aims to promote foreign direct investment through providing political risk insurance (guarantees) to investors and lenders, and helps the emerging economies to attract private investments (MIGA 2000). MIGA was created in 1988 in Washington DC, USA, with registered capital of 1 billion US Dollar. Its 2008 annual report stated that MIGA has issued nearly 20 billion US Dollar of guarantees for investment in 100 countries during past two decades. It currently guarantees the Nam Theun 2 Dam in Laos, and has guaranteed over thirty foreign investment projects in China (MIGA, 2008).

In 2005, MIGA representatives travelled globally to present its credential with potential clients. In China, MIGA met with a number of state enterprises including Sinohydro. After the initial meeting with MIGA in Beijing, Sinohydro Corporation Limited weighed the pros and cons for choosing MIGA over Sinosure. The company also discussed its current overseas business activities and subsequent international criticism on the impacts of their project investments, which they believed might be subjected to reputational risk.

To date, Sinohydro has only signed two BOT hydropower projects: the Kamchay Dam in Cambodia and the NN5 Dam in Laos. The Kamchay Dam is guaranteed by Sinosure providing an opportunity for the company to determine whether MIGA could be a potentially viable option for the NN5 Dam. Compared with most hydropower projects, the NN5 Hydropower Project is small and with limited negative impacts. The company felt that MIGA support for this project could be considered as a trial, to see whether MIGA could help the company learn and explore how international standards could be applied to its investments. In early 2006, Sinohydro began preparing the preliminary application and have continued negotiating procedures for approval with MIGA as recent as early 2010. If this project is approved, it will be the first project for a Chinese company to use MIGA's insurance guarantee services.

In October 2007 MIGA approved a new Environmental and Social Safeguards Policy. However, given that the NN5 application process was started prior to the approval of the new policy, MIGA continues to apply the old policy. This policy requires its clients to abide to its 'issue-specific' policy. Therefore, for the NN5 Dam project to be successful, MIGA's Involuntary Resettlement Policy, Dam Safety Policy, and Indigenous People Policy must be applied. The Involuntary Resettlement policy addresses the livelihood losses of the impacted community, which requires a livelihood restoration plan that could sustain and improve the livelihood. The impacted community is classified by MIGA as indigenous groups, i.e., Hmong, Khmu, and Lao-Loum, and thus informed consultation on mitigation measures is needed. The project also needs to consider whether or not to incorporate the impacted indigenous people in the project preparation and implementation and to address their special needs in the livelihood restoration plan and other relevant documents.

Box: What is Sinosure?

Sinosure is the only Chinese official import -- export credit insurance agency. It has played a crucial political role in supporting the Chinese international trade growth, foreign investment in China and Chinese investment aboard on raw materials and infrastructure construction, by providing risks guarantee services. Sinosure is a state insurance enterprise within the Ministry of Finance, which oversees its capital and cash flow. It grew out of the Export Credit Insurance Departments of the People's Insurance Company of China (PICC) and China EXIM Bank in late 2001. It operates as a central government policy implementer to provide support to companies engaging in overseas business and investment. The business partnership between Sinosure and Sinohydro in overseas construction business has existed for decades, mainly on risk guarantee of import and export of construction machineries. Sinosure initiated its investment risk guarantee in 2005 and Sinohydro's Kamchay Hydropower BOT project in Cambodia is presumably the first long-term foreign infrastructure investment project approved. By the end of 2007, Sinosure has guaranteed about 32 investment projects (Sinosure, 2007).

(Sinosure 2007)

The Dam Safety Policy will also be applied and the dam design is required to be reviewed by independent experts.

Compare to the Lao National Policy on environmental and social sustainability of the Hydropower Sector issued in June 2005, MIGA's policies are more responsible to follow up the actual effort of mitigation activities. This National Policy is based on activities of a World Bank funded project – Nam Theun 2 hydropower development. It merely described few key issues that hydropower developers need to considered, such as environmental assessment, project affected people, information disclosure. The policy language used is weak and vague with no enforcement action.

Table 4: Comparison between Sinosure and MIGA[13]

	SINOSURE	MIGA
Nature	The only policy-oriented Chinese insurance company that specialises in export credit insurance.	Member of the World Bank Group that provides non-commercial guarantees (insurance) for investments made in developing countries.
Mission	To protect Chinese companies from commercial and political risks in export and overseas investments, improve the competitiveness of Chinese companies in international markets, and render them strong support in their overseas expansion.[14]	To promote foreign direct investment into developing countries to help support economic growth, reduce poverty, and improve people's lives.
Establishment	2001	1988
Service coverage	Short, medium and long-term export credit insurance, investment insurance, bond and guarantee, credit rating service and debt collection. The investment insurance covers risks of: • Expropriation • Restriction on transfer and conversion • War damage • Inability to operate due to war • Breach of undertaking	MIGA's guarantees protect investors against the risks of: • Transfer restriction (including inconvertibility) • Expropriation • War and civil disturbance • Breach of contract
Eligible applicants	Enterprises and financial institutions that are registered and have their principal place of business in mainland China only.	Investments must be made in a developing country that is a member of MIGA, and it must be a new, cross-border investment, or investments

[13] The information pertaining to the difference in costs between Sinosure and MIGA is not available in the public domain.

[14] Corporate Culture, Sinosure Annual Repot 2003, p17.access Jan 20, 2009 http://www.sinosure.com.cn/sinosure/english/pdf/chart.pdf

	Financial institutions that provide financing for overseas investments by the enterprises with the above criteria.[15]	associated with the expansion, modernisation, or financial restructuring of existing projects, and acquisitions involving privatisation of state enterprises. Investments should contribute to host country development objectives and be financially, economically, and environmentally sound.[16]
Associated Policies	• Equity insurance policy • Shareholder loan policy • Financial institutions loan policy • Other policies from central government	• Policy on Disclosure of Information, • Policy and Performance Safeguards on Social and Environmental Sustainability. • Policy on Anti-corruption and Anti-fraud.[17]
Other services	• Risk management • Information service	• Technical assistance • Information service • Dispute mediation program[18]

Factors driving Sinohydro towards more responsible hydropower development

Under China's *Going Global Strategy,* China has made laudable efforts to develop policies and guidelines to govern overseas investment. While this is still a nascent process, it has great potential for addressing and mitigating potential conflicts over investments in sensitive projects such as hydropower dams. However, many challenges remain, as demonstrated by the guidelines for Chinese overseas investments in silviculture operations(Rutherford, Lazarus et al. 2008), which stipulate that Chinese companies should adhere to the laws of the countries in which they operate. In the case of countries in the Mekong Region, these laws are widely recognised as being poorly implemented. Sinohydro's decision to cooperate with MIGA over Sinosure symbolises a new move for Chinese overseas investment. There are two main reasons for this decision.

The first reason is that Sinohydro wants to improve the company's performance, and enhance its image and competitiveness in the international business environment by learning and using methodologies on how to incorporate internationally recognised standards into project development and financing. Many of Sinohydro's projects, though they were merely responsible for project construction, have been heavily criticised through the international media for its lack of responsibility towards environmental impacts and impacts on local communities. As Sinohydro moves towards long-term investment management, the pressure to change and to improve its image and competiveness become even more crucial, and the company needs to know whether this cooperation could upgrade their performance and image through following the guidance and assistance provided by MIGA.

The second reason is that most Lao people are living on subsistence livelihoods, that is, relying on natural resources for food and income. Hydropower development and

[15] http://www.sinosure.com.cn/sinosure/english/products_introduction01.htm
[16] Investment Guarantee Guide, MIGA, http://www.miga.org/documents/IGG06+pa.pdf
[17] http://www.miga.org/policies/index_sv.cfm
[18] http://www.miga.org/about/index_sv.cfm?stid=1588

operation is widely recognised as bringing significant impacts to the environment and consequently impacting local communities. Further, the NN5 Dam is located in apolitically sensitive area of the country. MIGA has twenty years of work experience on political risk insurance and has developed a series of guidelines and safeguards to avoid, mitigate and monitor the political risks. It currently guarantees the Nam Theun 2 Hydropower Project in Laos. The World Bank, the umbrella organisation of MIGA, has significant economic and political influence in its member countries, including Laos. When political disputes occur, the World Bank will use its influence to pressure the government to solve issues or play an arbitration role between the government and corporation, thus helping to restore the political stability.

The Decision-making Process for the Sinohydro-MIGA partnership

In 2006, Sinohydro and MIGA embarked on a partnership after Sinohydro submitted an initially preliminary application for the NN5 Project. It was followed by a process involving the submission of a formal application, which included the Social and Environmental Impact Assessment, Environmental Management Plan and Social Action Plan in 2007. After the revision of the project documents MIGA classified the NN5 hydropower project as a Category A project[19] that triggers a minimum disclosure period of 60 days. The project documents were disclosed on November 21, 2007 on the MIGA website[20](MIGA 2007 a). Up until February 2010, MIGA officials have carried out four due diligence visits to the project area -- October 2007, July 2008, July 2009, and February 2010. During the first visit to the NN5 project site, MIGA officials met with Provincial and District government officials and visited the Ban Chim village. During their July 2009 visit, MIGA visited the Ban Chim Village and dam construction site. Based on their disclosure policy, MIGA sponsored a public workshop to discuss the development of the NN5 hydropower development in August 2008.MIGA later contracted the Lao Consulting Group Ltd, as an independent consulting firm to conduct a Livelihood Restoration Plan for the impacted village – Ban Chim.

The decision making process between Sinohydro and MIGA mainly concerns two areas, namely the terms of reference on the business contracts, and the social and environmental concerns of MIGA – the key area of prevention and mitigation of political risk. The detailed discussion on the terms of reference, responsibility and cost of insurance coverage of MIGA's political insurance guarantee contract is ongoing between MIGA, Sinohydro and the China EXIM Bank. It is expected that the MIGA Board of Directors will discuss about the case and make a decision sometime in 2010 but that depends on the findings from MIGA's most recent field visit in February 2010. Sinohydro is highly confident that MIGA will approve the project as they have conducted a series of activities based on MIGA's recommendation.

The social aspects of the project have been deemed the most difficult to mitigate. Whilst the impacts are not great in comparison to many other projects, e.g. the Nam Theun 2 project in central Laos, MIGA has found it difficult to see a reasonable plan for mitigation. The Livelihood Restoration Plan, sponsored by MIGA is a requirement of the Lao government in order to achieve final approval by the National Assembly

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19 MIGA's Category A Project refers to a Project with "potential significant adverse social or environmental impacts that are diverse, irreversible or unprecedented."

20 This project application was submitted before October 1st, 2007. Therefore the project is considered under MIGA's former Environmental and Social Safeguards Policy and former Disclosure Policy. This information was stated in MIGA's website: http://www.miga.org/news/index_sv.cfm?stid=1506&aid=1640

for construction. It is also is an important document for MIGA to gain its own Board approval, and to monitor the livelihood recovery and restoration of the impacted community in the future. However, the final draft plan has only re-identified and updated the potential livelihood loss of the impacted village – Ban Chim, from the previous Social Impact Assessment. The Plan did not provide any concrete implementation recommendations as was never fully finalised. As a result, Sinohydro separately contracted another Lao-based consulting firm to determine ways to implement the Livelihood Plan. MIGA is pleased with the new contract and Sinohydro is funding the costs directly as opposed to seeking assistance from MIGA.

Transparency is one of the concerns and requests of MIGA. After MIGA's July 2009 visit, Sinohydro created a webpage that provides updated project relevant information to the public (http://eng.sinohydro.com/en/idems/nprofile.asp). This includes brief information about the NN5 project, the EIA, EMP, SAP reports and certificates, the social and environmental obligation, monthly reports on environmental and social issues and activities, the introduction of the environmental and social management teams and consultants, and some photos that show the workshop and site visit by outsiders. Despite the disclosure of such information, its creditability is still doubtful for instance; the approval document of the *Environmental Obligations on the company for the NN5 Hydropower Project* is actually an official document that gives comments for amendment of the document. The actual document has not been placed on the web although MIGA has directly confirmed that the project was approved by the Lao National Assembly in November 2009.

Nevertheless, Sinohydro has conducted a series of activities to prepare for the compensation of impacted communities. These activities include an updated baseline survey and health check of Ban Chim village, establishment of the Environmental and Social Management Office (ESMO), and recruitment of a local well-known environmental consultant company – Earth System Laos – as the project's local environmental and social consultant in the ESMO team (NN5 Monthly Report, 2009). In addition, an in-depth survey for compensation of flooded rice fields has been carried out, which claims a smaller flooded area.

How MIGA's partnership with Sinohydro has influenced the company's efforts to address corporate social responsibility

MIGA's global promotion trip to China in 2006 demonstrated to Sinohydro their unique strengths as part of the World Bank Group. MIGA has over twenty years of work experience on political insurance guarantees and throughout this time, they have developed international standards for social and environmental issues to avoid, mitigate or compensate adverse impacts on workers, communities and the environment. MIGA's influence in the countries in which they operate is strong and MIGA has placed a role in dispute negotiation through the World Bank. These kinds of attributes are of significant interest to Sinohydro. The cooperation between Sinohydro and MIGA seems a good prospect that Chinese state enterprises are moving towards in terms of adhering to international environmental and social standards. Yet, how will this partnership influence Sinohydro's corporate social responsibility in overseas investment and MIGA's future cooperation with Chinese state enterprise?

The negotiations among Sinohydro, the China EXIM Bank and MIGA are in the final stage, and all parties are confident in partnership success. This process has been considered special in terms of its time allocated to learning for Sinohydro and MIGA. In many countries that MIGA operates, deals are made fairly quickly and the organisation has done its due diligence. However, in this case there has been a long lead-time enabling MIGA to work closely with Sinohydro in the preparation and move towards Board approval. Whilst the process has not been easy, MIGA does see this as beneficial to Sinohydro whereby increasing the learning within the company. From Sinohydro Ltd, this process has enabled them to explore how to work with an international organization and to learn about internationally recognized Environmental and Social safeguards. With this partnership, Sinohydro could elevate its international image. MIGA, on the other hand, has learnt more about the way in which Chinese state enterprises think and operate, especially on their social and environmental standards.

MIGA, through its due diligence visits, has shown their concerns on the social impacts of the dam impacted village Ban Chim. The Social Action Plan made by Dongsay Consultant Company Ltd is clearly insufficient to mitigate the impacts. According to its policy, MIGA requires its clients to undertake additional assessments when existing documents do not meet the requirements of its Performance Standards.

The Livelihood Restoration Plan (LRP) provided MIGA and Sinohydro a detailed baseline survey of Ban Chim village, and a comprehensive impact analysis of villagers based on the flooding level given by the NN5 Company. It revealed much bigger impacts compared to the original Social Impact Assessment. For instance, the SIA estimated 55 hectares of rice fields would be inundated, while the LRP calculated43 hectares of irrigated lowland and 69 hectares of rain-fed lowland will be lost. The fishery issue was not mentioned in the SIA but was reported in the LRP as a vital adverse impact to the majority of villagers who fish for consumption and for generating valued at249.10 million Laotian kip ($29,306 USD) (Lao Consuting Group 2009). However, instead of providing a livelihood restoration plan, this LRP merely provides few options to be considered, for instance, modern grazing of livestock, promoting of handicraft, and exploring alternative crops, Thus, it weakened its legitimacy in the decision-making process, and could not be used as feasible guidance for the Lao government and MIGA's future monitoring.

In addition, MIGA's performance standards clearly mention that its clients need to develop an action plan that reflects the results of consultation with adverse impacted communities on social and environmental risks. The action plan needs to address the necessary actions for mitigation, prioritize them with an implementation timeline, disclose the actions to the affected communities and illustrate the mechanism for external reporting of actions (MIGA 2007 b). As of end of 2009, these documents have, so far, not yet complied with the MIGA's policy. As a result, in MIGA's July 2009 visit, the social impact experts listed a series of comments for improvement; it is hoped that through these improvements the project could meet the standard of MIGA's policy.

The initial plan of Sinohydro to sign the contract with MIGA was in February 2009. But, as of early 2010, the NN5 Project proposal has not been put forward for approval. This is due to the lack of sufficient legal documents for MIGA's Board approval as well as insufficient action to address livelihood restoration of the impacted community. MIGA has not seen this delay as problematic but more of a learning process that has been beneficial for the company and MIGA. However, the loan from China EXIM Bank has not yet released for the project due the fact that Sinohydro has not yet signed a contract with MIGA. Therefore, from the Sinohydro side, the delay by MIGA may be seen as problematic as they have to pay for the current costs of the project themselves. Whilst these negotiations are taking place, the construction of the project has halfway towards completing construction and aims to finish by 2011.

At this stage, MIGA's leverage in terms of holding the NN5 Company accountable for the project's social and environmental responsibility is much higher given the eventual need by Sinohydro for insurance. TheNN5 company staff have carried out a series of activities following the comments by MIGA's social and environmental team. The practice of "learning-by–doing" has gradually built up the company's capacity, but this is still far below MIGA's requirements and it is believed that there will be difficulties in meeting future challenges. As a response, the company hired a well-known foreign consultant firm to address the environmental impacts and local livelihood restoration.

Upon project approval, MIGA's ability to ensure an upholding of its safeguard policy and the company's ability to follow-through in the longer are, however, uncertain due to several factors. The first is the need for continuous attention, commitment and effort by the company to address the project's social and environmental impacts and livelihood restoration activities of impacted communities. The second is the human resources capacity needed as most of the Sinohydro staff has expertise in hydrological, civil engineering or business. Addressing social issues (such as grievances, conflict and sustainable livelihoods strategies) and environmental protection is a new areas requiring more time to truly understand the impacts and put in place a sound restoration plan. The third is MIGA's monitoring mechanism. It is a complicated scenario for MIGA staff, who are based in Washington DC, to be able to follow the day-to-day activities of the project. It is already clear that whilst the MIGA staffs have been providing support during their visits, three to four day annual due diligence visits is clearly insufficient to ensure the project has upheld MIGA's standards. This is partially why Sinohydro has sought a local consulting firm to assist it to move the project further along and assist their thinking in terms of the livelihood restoration plan.

Conclusion

Understanding the motivation behind Sinohydro to partner with MIGA for a political risk guaranteed can never fully be understood. However, Sinohydro, like many other state enterprises undergoing national sectoral restructuring along with the governments "Going Global" policy, is striving to improve its international image and to increase its competitiveness in the international market. In this day and age these are major efforts needed that require innovative thinking and repackaging of projects to ensure there is no reputational risk to the company and to be internationally competitive. The collaboration with MIGA has not been easy nor has can it be seen in black or white. Whilst MIGA has strived to provide high-quality interventions to uplift and improve the project preparation and implementation by Sinohydro, there have been some limitations given MIGA's distance from the project team and site along with the complicated nature in working with a first-time company that is seeking its partnership. For Sinohydro, they do benefit from MIGA's standards and whilst high quality, the company may not have received the day-to-day advice that it requires and that may not have been part of the original agreement between the two entities. However, the on-the-job learning that MIGA has provided to Sinohydro has yielded an increase in capacity among the Sinohydro staff and a greater understanding of international practices along with the ability to work with staff from an international organization.

Perhaps in future, as Sinohydro embarks on larger and more complex projects, they will be able to weigh the pros and cons of partnering with domestic or international organisations so as to improve their project preparation and implementation.

The process between MIGA and Sinohydro is coming to an end in terms of the future being near for MIGA board approval. This is of course subject to MIGA feeling that enough progress has been made and that they are secure in their thinking to submit the project for approval. Sinohydro is in desperate need of a loan from the China

EXIM Bank, and MIGA's approval is the crucial missing element for loan release. Consequently, MIGA's comments on the efforts to date to address the social and environmental improvement plans have been effectively implemented is near. Upon approval and implementation of these plans, the challenge will lie in whether MIGA can continue to hold the company to its international standards and for Sinohydro to continue to fulfil its obligations in addressing the social and environmental issues of the project

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E-Flows in the Nam Songkhram River Basin
David JH Blake et al

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Executive Summary

Environmental flows (E-Flows) are broadly defined as the provision of water for freshwater dependent ecosystems to maintain their integrity, productivity, services and benefits – particularly in cases when such ecosystems are subject to flow regulation and competition from multiple water users. Simply stated, E-Flows could be thought of as "ecological water demand" that should be regarded as a legitimate water use sector, just as the industrial or agricultural water use sectors are. Negotiating water flows is an essential part of river basin management in the Mekong Region, but has hitherto not been well articulated or recognized by water sector policy makers or planners. Implementing Environmental Flows requires establishing water flow regimes, which recognise ecosystem needs whilst trying to satisfy social, economic, and cultural dimensions.

Although there is a considerable amount of information, knowledge and experience behind the E-Flows concept, national and international environmental policies rarely take E-Flows into account. Only a few countries such as Australia, South Africa and the United Kingdom have integrated the concept into water management policy and practice. For most countries in Asia, the E-Flows concept is in its infancy and local approaches have yet to be applied.

The approach explored in Thailand for the first time has been developed based on the conviction that E-Flows does not only consider the importance of river flows from a physical or ecological perspective, but also relates to the socio-political side of the equation. The role that people play both as beneficiaries of the wider riverine ecosystem and at the same time, modifiers of the ecosystem are key to understanding E-Flows, "*flow is the key driver of the system*." (IUCN, 2005). The interdisciplinary Environmental Flows work in the Songkhram River Basin was a preliminary attempt at integrating aspects of an Environmental Flows approach into a systematic attempt to better understand the relationships between hydrological flows, floodplain ecology and people's dependency on the floodplain and its services. The study emerged from a growing concern amongst many actors that river basins in Thailand are not being well managed and the core ecosystem services and functions they provide are gradually being degraded and diminished.

The findings and conclusions from the field assessments include:

- The lower reaches of the Nam Songkhram River is still a functional floodplain system, indicated by the wide diversity of aquatic fauna still present and a broad range of habitats, both aquatic and terrestrial. Further up the river system the period of annual flooding decreases and human disturbances increase, with a corresponding decrease in aquatic biodiversity and productivity. This type of floodplain river system dependent on prolonged annual flooding and inter-connectedness with the mainstream Mekong is now unique in Thailand and thus has high conservation value.
- The study confirmed and strengthened the understanding of the close relationship between the mainstream Mekong river and the lower Nam Songkhram River Basin (LSRB), in terms of both ecology and hydrology, in particular the role of extensive seasonal flooding arising from a notable backwater and occasional backflow effect on to the LSRB floodplain. Comparisons with the Tonle Sap and Great Lake hydrology are valid and worthy of further research, as both systems are representative of "flood pulse" river systems that underpins the biodiversity and productivity of each system.
- Because of the primary influence of the Mekong mainstream on LSRB flood timing, duration and extent (as highlighted in WUP-FIN models), any attempt to control flooding by building flow control infrastructure on the Lower Songkhram River or main tributaries like the Nam Oon, is likely to be futile and counterproductive, creating new and undesirable environmental impacts, which so far have not been taken into account in project proposals.

- The LSRB floodplain is in the latter stages of an ecological transformation from being dominated by natural vegetation and diverse wetland habitats, to a more simplified ecosystem with fewer habitats, less biodiversity and enhanced anthropogenic disturbance. This is principally as a result of removal of natural vegetation and conversion to agricultural land, in particular paddy fields and latterly, industrial tree crops such as eucalyptus plantations. The ecological impacts of this transformation are not well studied, but anecdotal evidence from local resource users and some empirical evidence collected during the study suggests that they have deep-reaching implications in terms of biodiversity loss and reduced aquatic productivity. The loss of ecosystem functions and services appear to be having serious negative impacts on fishery productivity and local livelihoods through food and income security declines.

The work of the Nam Songkhram Basin E-Flows study continually stressed the cross-sectoral and inter-disciplinary linkages at the core of the process and underpinned the effort. It helped cement and broaden understanding amongst the team members and allowed them to talk more confidently about issues outside their core discipline when communicating with interested observers, according to participant’s feedback. Simply put, they began to appreciate the wider linkages between flow, ecosystem and livelihoods towards the end of the process, which were not immediately apparent from the start. An increased knowledge and understanding of the river floodplain system and how hydrological flows affect it, is a key output of the E-Flows process. An unexpected output was the realization that there are several other analogous “flows” occurring on and around the floodplain, beyond the simply hydrological flows which consumed most of the team’s attention. These include the flow of natural resources on and off the floodplain and the flow of people in and out of communities, which it was felt by some team members are equally deserving of further attention in future studies.

Acronyms & Abbreviations (Selected)

ADB	Asian Development Bank
ADCP	acoustic Doppler current profilers
ALRO	Agricultural Land Reform Office
AMCF	Assessment of Mekong Capture Fisheries
ARD	Accelerated Rural Development Office
CPUE	Catch per Unit Effort
d/s	downstream
DEDP	Department of Energy Promotion and Development
DLD	Department of Land Development
DoF	Department of Fisheries
DWR	Department of Water Resources
EIA	Environmental Impact Assessment
EC	Electrical Conductivity
GIS	Geographic Information System
GMS	Greater Mekong Subregion
IBFM	Integrated Basin Flow Management
IFA	Intermediate E-Flows Assessment
IPM	Integrated Pest Management
IUCN	International Union for Conservation of Nature
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
K-C-M	Khong-Chi-Mun
KKU	Khon Kaen University
LMB	Lower Mekong Basin
LSRB	Lower Songkhram River Basin
MCM	Million cubic metres
MoAC	Ministry of Agriculture and Cooperatives

MoNRE	Ministry of Natural Resources and Environment
MoSTE	Ministry of Science, Technology and the Environment
M-POWER	Mekong Program on Water, Environment and Resilience
MRC	Mekong River Commission
MRCS	Mekong River Commission Secretariat
MSP	Multi-stakeholder platform
MWBP	Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme
NE	Northeast
NEB	National Environment Board
NGO	Non-government organization
NPA&CO	Nakhon Phanom Agriculture and Cooperatives Office
NTFP	Non-timber forest product
OM	Organic matter
O & M	Operation and maintenance
ONEP	Office of Natural Resources and Environment
OTOP	One Tambon One Product
ppm	parts per million
PAO	Provincial Administration Office
PDR	People's Democratic Republic
RBO	River Basin Organization
RID	Royal Irrigation Department
SME	Small and Medium Enterprise
SPV	Special Purpose Vehicle
START-Chula	(SysTem for Analysis Research and Training) - Southeast Asia START Regional Centre, Chulalongkhorn University, Bangkok
TAO	Tambon Administration Organisation
TEI	Thailand Environment Institute
TNMC	Thai National Mekong Committee
TS	Time Series
WANI	Water and Nature Initiative
WIAM	Wetlands Inventory, Assessment and Monitoring
WUP-FIN	Water Utilization Programme-Finland

List of authors and contributors

The preliminary part of the Nam Songkhram E-Flows process was planned and facilitated by staff of IUCN in collaboration with other interested partners, including the International Water Management Institute (IWMI), the Mekong River Commission Secretariat's Environment Programme and Water Utilization Programme and MWBP. The staff formed a core working group and consulted with potential partners, thus determining the need for a study in the Nam Songkhram Basin. Then they began the process of recruiting a team to conduct the E-Flows assessment. In practice, this was mainly done through the network of partners already established under the MWBP Songkhram Demonstration Site, as well as through consultation with interested institutions at meetings held in early 2006.

The field study part of the Intermediate E-Flows Assessment utilized the skills of a small multi-disciplinary team of experienced researchers and managing staff including:

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Section 1: Environmental Flows and the Mekong Region

Introduction and Background of Study

Negotiating water flows between different user groups is an essential part of river basin management in the Mekong Region, including the rivers of Thailand. To help navigate these negotiations, an important tool has emerged internationally: the concept of environmental flows, or E-Flows. This refers to water provided within a river, wetland or coastal zone to maintain ecosystems and their benefits in the context of competing water uses. Simply put, the E-Flows concept tries to find a better balance between ecological and economic considerations in water planning. It brings to bear the idea of "ecological water demand," which should be regarded as a legitimate water-use sector, on par with industry and agriculture.

A number of international institutions are increasingly advocating the inclusion of E-Flows principles and approaches in river basin management and flow negotiations worldwide. The International Union for the Conservation of Nature (IUCN) has been particularly active for a number of years in promoting E-Flows approaches in its own and partners' work and projects in Asia and elsewhere. In 2003, IUCN published a book titled "Flow: The Essentials of Environmental Flows"[1], which introduces readers to Environmental Flows principles and offers practical advice for implementation of approaches based on examples from across the world. First published in English, "Flow" has now been translated into the main riparian languages of the Mekong River Basin, namely Burmese, Chinese, Khmer, Lao, Thai and Vietnamese.[2]

In 2006, IUCN developed a sub-programme on E-Flows to complement the Integrated Basin Flow Management (IBFM) programme led by the Mekong River Commission (MRC), which is focused on the Mekong mainstream. The IUCN's interdisciplinary sub-programme was developed in partnership with the International Water Management Institute (IWMI) and aimed to apply appropriate e-flows methodologies to the tributaries and river basins within the Mekong Region.

Regionally, in Vietnam there was an initiative to adopt an E-Flows approach as part of Integrated Water Resources Management (IWRM) goals in the Huong river Basin in central Vietnam, under the Ministry of Natural Resources and Environment. In 2003-04 an initial E-Flows assessment was conducted in partnership between the Thua Thien Hue Provincial People's Committee, the Huong River Projects Management Board, IWMI, IUCN and Water and Nature Initiative (WANI) as a case study. It illustrated the successes and challenges of E-Flows implementation in Vietnam, and more generally of translating internationally tested tools into the local context[3].

As for Thailand, E-Flows are a relatively new concept and are still at an early stage of recognition and application. Water management and river basin management have traditionally been the preserve of a relatively small sub-set of state actors, concentrated primarily within a limited number of key agencies. These water planners and decision-makers have mostly come from disciplines aligned to positivist or 'hard' science, dominated by engineers who have a tendency for partitioning knowledge about the resource into convenient reductionist or mechanistic modes of thinking. Therefore, this

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[1] Dyson, M., Bergkamp, G., Scanlon, J. (eds). (2003) Flow - The Essentials of Environmental Flows. IUCN, Gland, Switzerland and Cambridge, UK.xiv + 132 pp. – 2nd edition

[2] Copy of translations in Chinese, Burmese, Thai, Lao, Khmer and Vietnamese are available on the www.waterandnature.org

[3] A copy of the final report of the Huong River E-flows assessment can be downloaded at: www.iucn.org/places/vietnam

has tended to ignore more relativist, systematic, holistic and pluralistic modes of thinking or paradigms when considering water and river basin management. The predominant existing approaches to river basin management also discount the role and impacts of political patronage and interference on decision-making with regards to infrastructural development. E-Flows demands of practitioners new ways of conceptualizing aquatic ecosystems and associated natural resources, which inherently recognize the complexity and inter-dependence of socio-natural systems, adhere to the precautionary principle and allow multi-disciplinary approaches to research, which maximize cross-disciplinary linkages and participatory interaction by stakeholders.

In Thailand, the perception of all types of floods as a “natural disaster” with detrimental impacts has increased state-led efforts to control floods through building infrastructure. The report shows that in Songkhram measures have been promoted to control seasonal floods, but because of a poor understanding of the nature of the hydrological relationship between the Mekong mainstream and the Nam Songkhram, the upstream flood protection infrastructure developments appears not to have any impact on floods in the downstream floodplain. By modifying the flows, the entire flood plain system is threatened. Furthermore, the floodplain provides multiple benefits for the people living in the basin. By modifying the flow the ecology of the floodplain will change and local people depending on the resources generated from the floodplain will be impacted.

The E-flows project was implemented in 2006 – 2007 in the Songkhram River Basin situated in the Northeastern part of Thailand, with the specific objective of trying to make explicit the links between ecosystems, livelihoods and flows. The work combined field assessments and multi stakeholder dialogues to identify ways and means of introducing an Environmental Flows perspective to the management of the Songkhram River Basin and its water resources.

The approach applied in Thailand has been developed based on the conviction that E-Flows does not only consider the importance of river flows from a physical or ecological perspective, but also relates to the socio-political side of the equation. The role that people play both as beneficiaries of the wider riverine ecosystem and at the same time, modifiers of the ecosystem are key to understanding E-Flows, It has been stated that “flow is the key driver of the system” (IUCN, 2005) when referring to the pivotal role that river flows play in regulating nearly all aspects of riverine ecosystem productivity and health. The interdisciplinary Environmental Flows work in the Songkhram River Basin is a first step in providing data and practical tools for river basin and water managers at national, regional and local levels to apply similar approaches for better outcomes.

What are Environmental Flows?

Water flows have cultural, ecological, economic, political and social dimensions. The subject of “Environmental flows” or “E-Flows” covers all of these dimensions as a means of increasing our understanding about the relationships between humans and aquatic environments. In most river basins the natural flows have been modified to some extent, to meet the needs of human settlements, irrigators, flood controllers or energy generators. Proponents of E-flows acknowledge these different uses, but argue that ecosystems are another valid user, and that ecosystem and livelihood services must also be valued and included in negotiations about water use and basin management. The justification for adopting an E-Flows approach is partly justified by the Agenda 21 agreement, which Thailand has signed up to implementing[4].

Ideally, E-Flows negotiations listen to a range of world views and respect the knowledge derived from a number of disciplines. Perspectives from disciplines as diverse as

[4] Source: http://www.un.org/esa/agenda21/natlinfo/countr/thai/inst.htm

engineering, law, aquatic ecology, economics, hydrology, land management, political science, sociology and geography are all relevant to the application of E-Flows. The local ecological knowledge and perspectives of riparian people is also vital to be taken into account by those charged with planning water resources development, especially in developing countries.

Box 1 What are E-Flows
"Environmental flows means enough water is left in our rivers, which is managed to ensure downstream environmental, social and economic benefits. Yet pioneering efforts in South Africa, Australia and the United States have shown that the process to establish them, especially when part of an integrated management approach, poses great challenges."

Achim Steiner, Director General of the International Union for the Conservation of Nature (IUCN) in Preface to "Flow. The Essentials of Environmental Flows." In: Dyson et al, 2003.

Box ends

"Flow" (p.17) defines an Environmental Flow as "….the water regime provided within a river, wetland, or coastal zone to maintain ecosystems and their benefits where there are competing water uses and where flows are regulated." This report will broadly adhere to this definition, although recognizing that the degree of regulation in Southeast Asian rivers is highly variable, with some rivers still having a near-natural flow regime, but could still benefit from application of an E-flows approach to management.

The main goal of Environmental Flows is to provide a flow regime that is sufficient in terms of quantity, quality and timing for sustaining the health of the river and other aquatic ecosystems. The level of health at which the river is sustained is, however, a societal judgement that will vary from country to country and region to region. What the appropriate environmental flow is for a particular river will thus depend on the values for which the river system is to be managed. Those values will determine the decisions about how to balance environmental, economic and social aspirations and the uses of the river's waters.

It is important that E-Flows considerations should extend beyond oversimplified concepts of minimum flows and should instead be regarded as *a flow regime, with a range of flow variables* such as magnitude, frequency, duration, timing and rate of change of flow. It should be stressed that E-flows are not natural flows, minimum flows or average flows, but are an integral part of the modern management of a river basin in which the value of functioning ecosystems is appreciated. It requires a desire to learn and engage in negotiations among and between stakeholders to bridge the different interests that compete for use of water. Using "Multi Stakeholder Platforms" (MSPs) or Dialogues are one way to provide space for learning and new insights for negotiations (for a Mekong example, see IUCN et al. 2007).

A range of tools and techniques are available for determining E-Flows requirements, from reconnaissance level hydrology-based studies to intermediate or comprehensive assessments which take into consideration biophysical, political, sociological, economical aspects of a range of management scenarios and flow regimes. A number of key components, or factors for success, need to be emphasized for E-Flows to move forward from conceptual plans to reality. These include the active participation of community representatives, water authorities, scientists and managers; development of legislation on sustainable resource use; and a shift towards sustainable wetland use.

Box 2 E-flows are critical to ecosystem health
“Rivers and other aquatic ecosystems need water and other inputs like debris and sediment to stay healthy and provide benefits to people. Environmental flows are a critical contributor to the health of these ecosystems. Depriving a river or a groundwater system of these flows not only damages the entire aquatic ecosystem, it also threatens the people and communities who depend on it.” p. 18, “Flows”, Dyson et al, 2003.
Box ends

In recent years, Environmental Flows information and knowledge exchange has started to expand, as more practical experience cases become available and interest grows worldwide, evident from such events as the International Riversymposium 2007 in Brisbane (http://riversymposium.com/index.php?page=symposium2007) and the resulting Brisbane Declaration[5] and the formation of an Environmental Flows Network (www.environmentalflows.net) in 2006 with a website and newsletter.

Water Resources in the Mekong

At 4,800 kilometres, the Mekong River is easily the longest river in Southeast Asia. It is the world’s eighth largest river in terms of water volume and twelfth longest. The Mekong river basin (watershed or catchment) covers an area of 795,000km^2, which represents a small percentage of the territory of China (Tibet and Yunnan), about 4 per cent of Burma, 97 per cent of Lao PDR, 36 per cent of Thailand, 86 per cent of Cambodia and 20 per cent of Vietnam.

Different actors have different geopolitical conceptualisations of the Region. When people speak of “the Mekong”, they may mean the river, the river basin or the region. In 2006 IUCN, the Thailand Environment Institute (TEI), IWMI, and M-POWER (Mekong Program on Water Environment and Resilience facilitated a Mekong Region Waters Dialogue inviting some 160 people representing a range of state and non-state institutions. The “…dialogue initiative defines its scope as the Mekong Region, which encompasses the territory, ecosystems, peoples, economies and politics of Cambodia, the Lao PDR, Myanmar, Thailand, Viet Nam, Yunnan and Guangxi provinces of China an area of 2.6 million km^2 which is home to a rapidly growing population of about 300 million people. In addition to the Mekong River basin, the region includes other major basins such as the Irrawaddy, Salween, Chao Phraya and Red Rivers. ADB refers to this as a ‘growth area’ and, with its partners, prefers to use the name Greater Mekong Subregion (GMS).

One of the key social challenges for the region is for diverse actors to negotiate a reasonable and equitable utilisation of water (Mingsarn Kaosa-ard and Dore 2003).

All six countries of the Mekong Region share the Mekong River and its aquatic resources. The “Lower Mekong” is a term sometimes invoked to mean the entirety of the four downstream countries – Thailand, Lao PDR, Cambodia and Vietnam. At other times the “Lower Mekong” is used in a more limited sense, to refer only to the parts of the Mekong River Basin in the sovereign territory of those same four countries. This present project has focused on the Nam Songkhram River Basin, a significant tributary of the Mekong

[5] The Brisbane Declaration was announced at the end of the 10th International River*symposium* and Environmental Flows Conference, calling on governments, development banks, donors, river basin organizations, water and energy associations, multilateral and bilateral institutions, community-based organizations, research institutions and the private sector across the world to commit to a range of actions for restoring and maintaining environmental flows (see http://waterplanning.org.au/related-research/the-brisbane-declaration-on-environmental-flows).

River located wholly in Thailand and of importance in terms of wetlands-based livelihoods.

Box 3 Holistic view of river systems

"Historically, water has been managed from a supply perspective with an emphasis on maximizing short-term economic growth from the use of water. Little thought has been given to the health of the resource itself and there is poor understanding of the implications of overuse or declining river health. Water resource managers are now trying to come to terms with the need to take a more holistic view of the river system. They increasingly understand that one needs to take care of aquatic ecosystems and the resources they provide for long-term economic viability" (In: Dyson et al, 2003).
Box ends

E-Flows is a relatively new concept in Thailand and is still at an early stage of recognition and potential application. Water management and river basin management have traditionally been the preserve of a relatively small subset of state actors, concentrated primarily within a limited number of key agencies. These water planners and decision-makers have mostly come from disciplines aligned to positivist or 'hard' science, dominated by hydrologists and engineers who have a tendency for partitioning knowledge about the resource into convenient reductionist or mechanistic modes of thinking. Therefore, the existing situation has tended to undervalue more relativist, systematic, holistic and pluralistic modes of thinking or paradigms when considering water and river basin management.

One of the key challenges for the Mekong countries is how to develop and improve the economic conditions and livelihoods of people, whilst maintaining the biodiversity and ecological health of the Mekong Basin. To begin to address this question, one first must ask if the value of natural capital (biodiversity and ecosystem health) are fully appreciated or accounted for by decision-makers and are they (planners and decision makers) fully aware of the number of people that are dependent on healthy riverine ecosystems for their livelihoods and well-being?

A number of attempts are being made by various institutions to better represent and articulate the values of the different water uses within the Mekong Basin, including an Integrated Basin Flow Management (IBFM) project in three phases recently implemented by the Mekong River Commission (MRC), which describes IBFM as "a set of multi-disciplinary activities enabling a scientific assessment of the impacts of possible future changes in flow on the environmental, social and economic beneficial uses of the river."[6] IBFM aims to provide information and knowledge to decision makers about the predicted costs and benefits of water resources development in the Mekong Basin in relation to river flow regimes.

IBFM ran in three phases between 2004 to 2008, before being halted by MRC and donors. The third phase of IBFM ran from 2006-08 and built on the earlier knowledge base to focus on research that reduces the uncertainties of the predictions, as well as plans to hold stakeholder consultation on the consequences of flow change in the mainstream. Specific outputs of the research included designing an adaptable "Mekong Method" for flow assessment and enhanced capacity of riparian staff to undertake IBFM activities. It was envisaged that the IBFM outputs would be used by riparian governments to consider the various development scenarios and make optimal decisions about water resources development that take into account the interests of the various stakeholders (Guttman, 2006).

[6] Quoted from: IUCN, TEI, IWMI and M-POWER, 2007. P. 44. Ibid.

It was against this general background and regional context that it was decided among interested actors in the Lower Mekong Basin to trial an E-Flows approach on the Nam Songkhram River (a tributary of the Mekong) in northeast Thailand. With the Lower Songkhram River Basin (LSRB) already a designated "demonstration site" for Thailand within the Mekong Wetlands Biodiversity Programme (MWBP)[7] and the national recognition of the LSRB as a wetland of "International Significance" in 1999 by the Office of Natural Resources and Environmental Policy and Planning (ONEP), a good opportunity was presented to apply an E-Flows approach to the Nam Songkhram Basin. With growing interest for flows-type approaches in the Lower Mekong Basin and policy changes in Thailand that emphasized public participation and decentralisation of decision-making in natural resources management, the time seemed appropriate around 2005 to bring the rhetoric of E-Flows out of the meeting room and test its applicability in the field.

This report

This study emerged as part of ongoing multi-stakeholder efforts to develop and strengthen integrated planning processes in the Mekong Region in general, and the Lower Nam Songkhram specifically, through the Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme (MWBP).. The approach explored in Thailand for the first time has been developed based on the conviction that E-Flows does not only consider the importance of river flows from a bio-physical or ecological perspective, but also relates to the socio-political side of the equation. The role that people play both as beneficiaries of the wider riverine ecosystem and at the same time, modifiers of the ecosystem are key to understanding E-Flows.

The interdisciplinary Environmental Flows work in the Songkhram River Basin is a preliminary step towards providing basic data and practical tools for river basin and water managers at national, regional and local levels to apply similar approaches for better outcomes.

The report is divided into five sections, which cover the various aspects of the theoretical and practical elements of the Nam Songkhram E-Flows Assessment process, from its first conceptualization to the completion of the Stakeholders' Dialogue Meeting and the preliminary conclusions and recommendations to emerge from the process.

Section One sets the scene and helps the reader conceptualise what Environmental Flows are in general terms (and what they are not) in the Mekong region. It sets out the background and context of why it was considered beneficial to locate Thailand's first in-depth E-Flows study within the Nam Songkhram Basin. It gives an idea of the wider context and events leading up to the Nam Songkhram E-Flows study and looks at other similar or complimentary studies conducted in the wider Mekong region.

Section Two focuses primarily on the particular setting of the Nam Songkhram Basin and gives a general description of the basin and a more specific description of salient biophysical features and the geopolitical context that underlies any efforts to introduce more sustainable development pathways into the management of wetland resources.

Section Three guides the reader through the general approach and specific methodology used by the E-Flows field study team to understand the Basin. It lays out the approach, objectives, methodology and background as well as outputs to the study in the Nam Songkhram Basin specifically.

Section Four presents the results from the wet and dry season field study, according to the findings submitted by each individual member of the multi-disciplinary team. Each

[7] MWBP was a joint programme between IUCN, MRC and UNDP.

disciplinary section is the primary work of the author indicated, but has been edited for language, clarity and consistency.

Section Five presents the results of the Multi-Stakeholder Dialogue Meeting and perspectives of various discipline specialists to introduce the E-flows approach to a wider audience of Nam Songkhram Basin actors and share the key Findings from the pilot E-Flows assessment, while listening to feedback from key basin stakeholders.

Section Six This section includes the future development scenarios adopted for consideration at a Scenario Workshop held soon after the fieldwork. It presents a summary of the technical process the disciplinary specialists participated in to conduct an Environmental Flows Assessment for each scenario and study site based on the findings from the field research and wider knowledge of baseline flow regimes.

Section Seven provides the lessons, conclusions and preliminary recommendations that resulted from the Nam Songkhram Basin E-Flows study.

Section Eight is the Bibliography.

Section Nine lists the annexes (with their respective website links) that provide more details on various aspects of the study as well as maps, figures and additional technical data, tables and illustrative material that are related to the main text of the report.

Section 2. Introduction to the Nam Songkhram Basin

The 495 km long Nam Songkhram River of northeast Thailand, rises on the forested slopes of the Phu Phan hill range and rapidly descends from the uplands to a broad floodplain surrounded by low alluvial terraces which have mostly been converted from forest to agricultural use. The Songkhram River Basin covers a total area of 13,126 km^2 and incorporates parts of four provinces (Udon Thani, Sakhon Nakhon, Nong Khai and Nakhon Phanom), with a population of about 1.45 million (Blake, 2006). Over the lower 300 km or so of the river's course, it gently traverses some of the most significant wetland habitats in Northeast Thailand (a region more commonly referred to as "*Isaan*"), before entering the Mekong River in Tha Utaen District of Nakhon Phanom Province, opposite Lao PDR.

The Lower Songkhram River Basin (LSRB) forms a complex mosaic of wetland habitats, both seasonal and permanent; riverine, palustrine and lacustrine; natural and artificial; which in recent years have started to be recognized for their significance in terms of biodiversity and contribution to maintaining local livelihoods. The Office of Environmental Policy and Planning responsible for wetlands designation nationally in Thailand, has declared the Lower Songkhram River Basin a wetlands of "international significance" (OEPP, 1999), yet despite this recognition has not given it any formal or legal protection. However, there is one discrete wetland site (Bung Khong Long lake) on the northern edge of the Nam Songkhram Basin which has been granted Ramsar Site status and is currently the subject of a World Wildlife Fund conservation project[8]. Wetlands habitats account for 54 % of the total surface area of the Nam Songkhram Basin (Sombutputorn, 1998) and even higher than this in the LSRB. Of particular importance is the role and function of annual flooding regimes to the locally abundant *paa bung paa thaam*[9] or seasonally inundated forest ecosystem, which is extensively utilized by local people and traditionally formed a vital part of the local economy.

Compared to other parts of *Isaan*, the Nam Songkhram Basin is subject to relatively heavy and dependable seasonal rains, ranging from 1,300 – 2,900 mm per annum in different parts of the basin, over 90 % of which falls in the six month wet season from May to October (Blake, 2006). This pattern leads to a distinct peak in run-off during August and September each year, when rivers and streams in the upper basin swell and frequently flood their banks causing localized flooding. As the swollen tributaries merge and reach the broad, flat floodplain in the lower basin, there is a distinct backwater effect caused by the influence of the Mekong River's level which hinders the drainage of the Songkhram River and contributes to widespread flooding each year.

In some years, when the Mekong River's level is particularly high, there will even be a reverse flow occurring with rich, silt-laden waters from the Mekong flowing back up the Songkhram River for many kilometres. In the average year, the flooding in the LSRB will cover an area of nearly 1,000 km^2, but in an exceptional year (i.e. a 1-in-50-year flood), the area inundated could be up to twice as much as this (Khon Kaen University, 1997). The flat topography means that a rise or fall in wet season water levels of just 10 centimetres can massively alter the land area under inundation.

The Nam Songkhram Basin is noted for its abundant and biodiverse capture fishery and associated living aquatic resources. One recent estimate of fishery production for the entire basin, calculated that the annual catch was in the order of 34,000 tons annually (Hortle and Suntornratana, 2008), while up to 187 fish species have been identified from

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[8]See: http://www.panda.org/about_wwf/where_we_work/asia_pacific/our_solutions/greatermekong/mekong_river/projects/ index.cfm?uProjectID=TH0855

[9] *Paa bung paa thaam* is the colloquial *Lao-Isaan* term for seasonally flooded forest, comprised of a mixture of low trees, thorny shrubs and bamboo clumps, which was at one time found in the lower floodplains of *Isaan*'s largest rivers, draining eastward to the Mekong.

the Nam Songkhram Basin during various studies in the past. Being an open riverine system intimately linked to the Mekong River mainstream in terms of ecology and hydrology, fish catches are highly variable both seasonally and inter-annually, with peak catches tending to coincide with the flood recession period in September to October/November. The fish biodiversity also varies from season to season with various studies based on both local knowledge (Tai Baan Research Network of the Lower Nam Songkhram Basin, 2006a and 2006b) and more scientific approaches pointing out the fundamental importance of the "flood pulse" (Junk and Wantzen, 2004; Lamberts and Bonheur, 2006) on abundance and variety of fish present in lowland tropical rivers, such as the Nam Songkhram (see Box: The flood pulse). In addition to fish and fishing, local communities depend on harvesting a massive array of other wetlands-derived organisms for their livelihoods, many of which are thought to be closely associated with energy and nutrient cycles dependent on the annual flood pulse phenomenon.

Box 4 The Flood Pulse

Central to any understanding of the natural flow regime and the floodplain ecosystem of large tropical rivers is an appreciation of the "flood pulse concept". Ecosystems that experience fluctuations between terrestrial and aquatic conditions are called pulsing ecosystems, and can be described in terms of the flood pulse concept (Junk 1997). Junk's flood pulse concept has been widely accepted as describing the highly productive floodplain environments and the ecology of pulsing systems. The flood water integrates the terrestrial vegetation into the aquatic phase of the ecosystem. This interaction between the terrestrial and aquatic phases is the driving force of ecosystem productivity.

This concept, mostly familiar to fishery scientists and riverine ecologists, is used to explain the annual natural cycle of flooding and drought found in rivers such as the Mekong/Tonle Sap ecosystem and the Nam Songkhram, which helps to create and maintain diverse and productive habitats on the floodplain.

Flood pulses in rivers and lakes can be described by a number of characteristics that are important from the ecosystem productivity point of view. The list of flood pulse parameters are analysed by Welcomme & Halls (2004) and adapted to the Mekong and Tonle Sap by Lamberts and Bonheur (2007). The list of characteristics is as follows:

- flood duration
- amplitude
- flood volume
- timing
- rapidity of the water level change
- continuity
- smoothness

Both the flooding and drought periods are important for maintaining the characteristics of the floodplain ecosystem, which undergoes dynamic and complex physical, biological and chemical processes during each part of the cycle. The processes are determined by the characteristics of the flood pulse, including the timing, duration, height, extent, continuity of flooding, number of peaks and speed at which the flood water covers the land surface. Many floodplain organisms, aquatic and terrestrial, have adapted to the flood pulse phenomenon and may be dependent on it for their survival. Altering or even halting the natural flood pulse can lead to drops in productivity and biodiversity.

Lamberts and Bonheur (2007) present a detailed description of the Tonle Sap flood pulse parameters susceptible to anthropogenic flow alterations in the Mekong, and discuss the possible impacts of these alterations on ecosystem productivity. This could be applied to Songkhram floodplain, acknowledging the slightly different ecosystem and floodplain characteristics (see more details in "hydrology" in Sec 4).

Sources: Junk and Wantzen, 2004; Blake, 2006; Lamberts and Bonheur, 2007
Box ends

At the same time as extensively harvesting local natural wetlands products, local people are also dependent on agriculture for part of their livelihoods, including rice-based farming systems, livestock, cash crops, and increasingly, industrial tree plantations. The LSRB has been a site of in-migration for several decades by intra-regional households to exploit available land and wetland resources, made available by favourable state development policy and the subsequent expansion of the agricultural frontier into upland and lowland zones alike (Blake and Pitakthepsombut, 2006). There has been considerable out-migration from the area, mostly of young, economically-active people to urban areas within Thailand, but also overseas, which illustrates the complexity of the region both ecologically and socially. One detailed socio-economic study of a LSRB village found that about 61 % of households derived their main income from off-farm sources and that the amounts earned from remittances were nearly three times greater than local agricultural earnings, with their uncertain nature and associated risks (Promphakping, 2002).

The Nam Songkhram Basin as a whole is too large and diverse to adequately describe and characterize in a report of this nature, which by necessity, must focus on limited and salient parts of most relevance. For a detailed description of the Lower Nam Songkhram River Basin, the reader is encouraged to refer to a “Situation Analysis” prepared for the MWBP (Blake and Pitakthepsombut, 2006) (please see Annex 1 on the Nam Songkhram River Basin for more details. Further site-specific details are given in section 4 under each specialist’s contribution).

Section 3: Environmental Flows in the Nam Songkhram River Basin

This section primarily lays out the approach, objectives and background to the study in the Nam Songkhram Basin specifically. Later sections consider the findings of the field study and subsequent ways in which those findings were used.

Approach and Objectives

A key goal of the Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme (MWBP) was to develop and strengthen integrated planning processes in the Lower Songkhram River Basin. This was to dovetail with efforts being taken at the national level to promote E-Flows amongst water planners and policy makers. From the early stages of the Nam Songkhram E-Flows process, it was considered desirable, if not essential, for the E-Flows study to be as non-prescriptive as possible. This meant that it would aim to be flexible and adaptive to the local situation and not follow a single methodology developed elsewhere (see Tharme, 2003 for an analysis of the wide range of environmental flow methodologies developed worldwide). Rather, it would be guided by a generalist approach that would follow certain guiding principles that would meet the study objectives.

Guiding principles

- ***Participation and inclusiveness.*** The process would strive to include a representative range of basin actors and stakeholders at various stages of the process, especially in terms of feedback during the planning and findings stages.

- ***Multi-disciplinarity.*** The study should ensure that the core E-Flows Team selected to conduct the field study would be representative of a range of disciplines that are strongly correlated to flows, ecosystems and livelihoods. The size and number of disciplines represented was ultimately a pragmatic decision to balance logistical and financial considerations with the more academic considerations. Six core disciplines were chosen.

- ***Cross-disciplinarity*.** As well as representing a range of disciplines, it was decided early that the E-Flows Team would strive to work closely together both in the field and afterwards to mutually analyse findings. This was aimed at fostering an active exchange of skills and knowledge, so that each expert would benefit from the knowledge and experience of the others. And the end product would thus be more holistic.

- ***Complementarity*.** The E-Flows study should be aware of other projects and activities in the Lower Mekong Basin, such as MRC's IBFM work and Huong River Basin work. The study should also share results with these other initiatives, partly through the regional work of MWBP and IUCN-WANI.

- ***Replicability* and *cost effectiveness.*** The approach would aim wherever possible to use local specialists to conduct the intermediate E-Flows assessments in order to maximize benefits to stakeholders, strengthen skills and utilize local knowledge. It would also be important to keep costs down to a reasonable level, so that such an approach is replicable by other institutions in Thailand and the wider Mekong Basin in the future.

- ***Relevance*.** The study should provide a present day snapshot of the Nam Songkhram Basin at representative sites for the benefit of others involved in basin management and for making predictive statements about potential future scenarios. For this to happen, the field study was timed to record the extremes of flow for the Nam Songkhram – i.e. peak flows in late August for the wet season and minimum flows in early March for the dry season. This timing was crucial for the specialists, only some of whom were initially familiar with the Nam Songkhram Basin, to gain full appreciation of the implications of the concept of "flood pulse".

Main Objectives

- Improve understanding of Nam Songkhram ecosystems and livelihoods, for the benefit of basin planning and policy-making at different levels.

- Improve understanding of E-Flows concepts and the importance of managing flows to ensure downstream ecological, economic and socio-cultural benefits.

- Build local technical and institutional capacity to apply concepts and integrate E-Flows principles into basin management plans.

- Initiate stakeholder dialogue across the four provinces of the Songkhram Basin to consider implications for the environment and society of possible future development scenarios for the basin (and beyond).

- Understand ecosystem roles in people's livelihoods, especially seasonally flooded forests, by establishing the present-day relationships between flow regime, ecology and human-level dependencies.

- Develop an appropriate set of tools and methodologies that can potentially be applied to other Thai river basins for those interested in applying E-Flows approaches at a later date.

Methodology

Initially, the entire concept of E-Flows was new to the MWBP staff and partners involved in the study. The process therefore emphasized three main aspects to the approach and methodology employed. In sum, these were 1) awareness raising and education; 2) field assessments; and 3) scenario-building and multi-stakeholder dialogue workshops. This process is explained in more detail below (see also Annex 2 Activity timeline).

The first part of the methodology involved raising awareness and education about E-Flows, including sharing and discussing related information to staff and partners, and wide stakeholder consultation and scoping. The process also included translating the book “Flow: the essentials of environmental flows” into Thai and sending the MWBP co-manager and key partners to events such as the Southeast Asia Water Forum in Bali in August 2005 to contribute to an E-Flows dialogue. A review of published documents related to the “flows” theme in the Nam Songkhram Basin was conducted and distributed to the E-Flows Team as background and reference material.

The second effort involved the collection of field data from representative sites in the Basin, using an Intermediate E-Flows Assessment (IFA) approach (see Table 1). This process integrated a range of specialists in a cross-disciplinary study. The assessment was designed to use a mixture of local and international expertise across a range of institutes and offering insights from social and natural sciences. Perhaps most significantly, the field studies were timed to coincide with the extremes of flow condition, with the first wet season study in late August and early September 2006 and the second dry season held in March 2007. This arrangement allowed the E-Flows Team to visualize and experience firsthand the flood pulse phenomenon from a relatively short period in the field and relate what was happening in the bio-physical and socio-economic-cultural spheres at these critical times of the year.

The E-Flows Team was expected to work closely together for a total of eight days (two days per site and a day at either end for planning and summing up, respectively) during the wet and dry season field visits. This gave the team an opportunity for detailed inter-disciplinary exchange, contributing towards the goals of capacity building and holistic understanding of processes. During the dry season visit, the team stayed overnight in the villages to facilitate closer interaction with village stakeholders. Further details of each discipline’s general methodology and approach can be found in the reports submitted by each specialist (Section 4).

Finally, the approach included two workshops: one a scenario-building exercise and the other a multi-stakeholder meeting (see sections 5 and 6). The scenario-building process involved using field findings and expert opinion (based on knowledge and experience of specialists in the IFA Team) to make broad predictive summaries about likely impacts on flow, ecosystems and livelihoods that would result from the outcomes of a range of possible scenarios. The methodology employed at the scenario-based workshop was primarily based on a semi-quantitative approach recommended by the E-Flows Team Leader, Rebecca Tharme, which is described. Finally, the outcomes of this exercise were used to inform the proceedings of a multi-stakeholder meeting at the end of the process that brought in a wide range of Nam Songkhram Basin actors, including officials from the state agencies charged with the task of developing water resources at a basin or provincial level. This approach allowed a diverse cross-section of basin stakeholders, representing different constituencies, to interact and discuss potential development trajectories and ways to improve the water-resources planning process at the basin level.

The above three points summarise the broad methodology employed in the study, but in reality the process was considerably more complex. It involved an iterative process of negotiation and compromise between the parties involved to produce a workable and acceptable methodology and approach that was appropriate to the local context and team members as a whole. Again, a key goal of the research was to be holistic and to build capacity while exchanging knowledge between disciplinary specialists. Therefore a condition of each specialist's approach was to explain and justify the methodology they were using to other team members on a daily basis. This approach helped to break down some of the disciplinary barriers and foster a better appreciation of commonalities across spheres of social and environmental knowledge. The process may have slowed the research of each specialist at times, but it also helped them question the basis and value of their own assumptions and approaches in light of others' observations.

It was recognized early in the process that to be effective, the approach would have to be relatively simple, replicable, affordable and understandable to stakeholders. (That also implied that the language used should be relatively free of jargon.) This was especially important in a bilingual exercise, in which English was not the first language of the majority of the team. Indeed, English was a real challenge for several members of the team even for everyday usage. For this reason, and in order to encourage inter-disciplinary exchange, it was decided to avoid the use of complex terminology, jargon or acronyms wherever possible, rather than to introduce a whole new disciplinary terminology.

The actual process of defining the research framework and methodology of the Nam Songkhram Basin E-Flows assessment was guided as much by pragmatism as it was by any formal methodology in existence. The study had tight restrictions on time and budget, so these constrained the limits of what could be achieved. Six key desirable disciplines were selected: fisheries, aquatic ecology, land use and agriculture, hydrology and geomorphology, and socio-economics. Then specialists in each of these disciplines were recruited from institutes within the northeast region. In the case of hydrology, a specialist was selected through collaboration with the MRC's WUP-FIN (??) hydrological modeling component of the Mekong River Basin. The E-Flows Team was able to call upon staff from the Thai Department of Water Resources to assist with making detailed measurements of flow and other conditions at each site. It was agreed that the assessment level best suited to the resources available for the Nam Songkhram E-Flows study would be described as an "Intermediate E-Flows Assessment", which would give a medium level of confidence and resolution of the findings (Table 1).

Table 1. Levels of Environmental Flows Assessments (EFA) - implications					
Method	Resources	Time	Confidence	Resolution	Status
Desktop - rapid	Low	2 days – 2 weeks	Low	Low	Planning guide
Intermediate	Medium	8 weeks	Medium	Medium	Preliminary EFA
Comprehensive	High	32 weeks	Medium / High	Medium / High	Full EFA

(Source: Tharme, 2007. E-Flows Scenarios Workshop, Udon Thani)

While it was agreed that an understanding of the hydrological condition and characteristics of the river was important, the overall emphasis of the study was to be placed on comprehending the ecological and social links involving the floodplain wetlands. This was to be based on both direct empirical observations and secondary data available from a variety of sources. However, it was stressed from the outset that an understanding of the "flood pulse" concept and key hydrological events would be important for the team. These included such factors as the magnitude, duration, timing, frequency of the flood, as well as peak- and low-flow characteristics.

Site Selection

Site selection was based primarily on time considerations. There was approximately one week available for each of the dry and wet season field studies. To maximize this narrow window it was considered feasible to cover just three representative sites, with two days per site for field observation and measurements. Three sites were chosen that were broadly representative of the Nam Songkhram Basin's main ecological characteristics.

These were:

Site 1. Middle Songkhram Basin
Ban Kham Chi, Fao Rai District (Nong Khai Province) (Grid Reference - 48Q 032 9940 - UTM 198 2740)

This site is situated in the middle reaches of the Nam Songkhram River, about 10 km downstream from water gates and a concrete weir-like structure built in 2004. These structures have modified river flow. Remnant patches of riparian forest are situated on the floodplain among extensive cleared areas and some permanent water bodies. On elevated alluvial terraces either side of the floodplain, rain-fed agricultural land is cultivated with rice, various cash crops, rubber and eucalyptus plantations. Ban Kham Chi village is located about 1 km from the river on the east bank.

Site 2. Lower Songkhram Basin
Ban Tha Bor, Sri Songkhram District (Nakhon Phanom) (Grid Reference - 48Q 041 8225 - UTM 195 1951).

This site is one of the best-known villages in the region for productive fisheries, with a fish-processing cottage industry using local and imported fish. It is located around 5 km from Sri Songkhram District town in the centre of one of the broadest areas of the Nam Songkhram floodplain. It features a wide variety of wetland habitats, including seasonal and permanent water bodies and an extensive area of seasonally flooded forest that has been progressively cleared for rice fields and eucalyptus plantations. The village of Ban Tha Bor is on a slightly raised levee of the Nam Songkhram and becomes an island during flooding, with water stretching many kilometers in all directions. Near to Ban Tha Bor is a former area of public land known as Tung Mon, which was claimed by an agribusiness company and has been used for intensive tomato and sweet corn cultivation for about two decades.

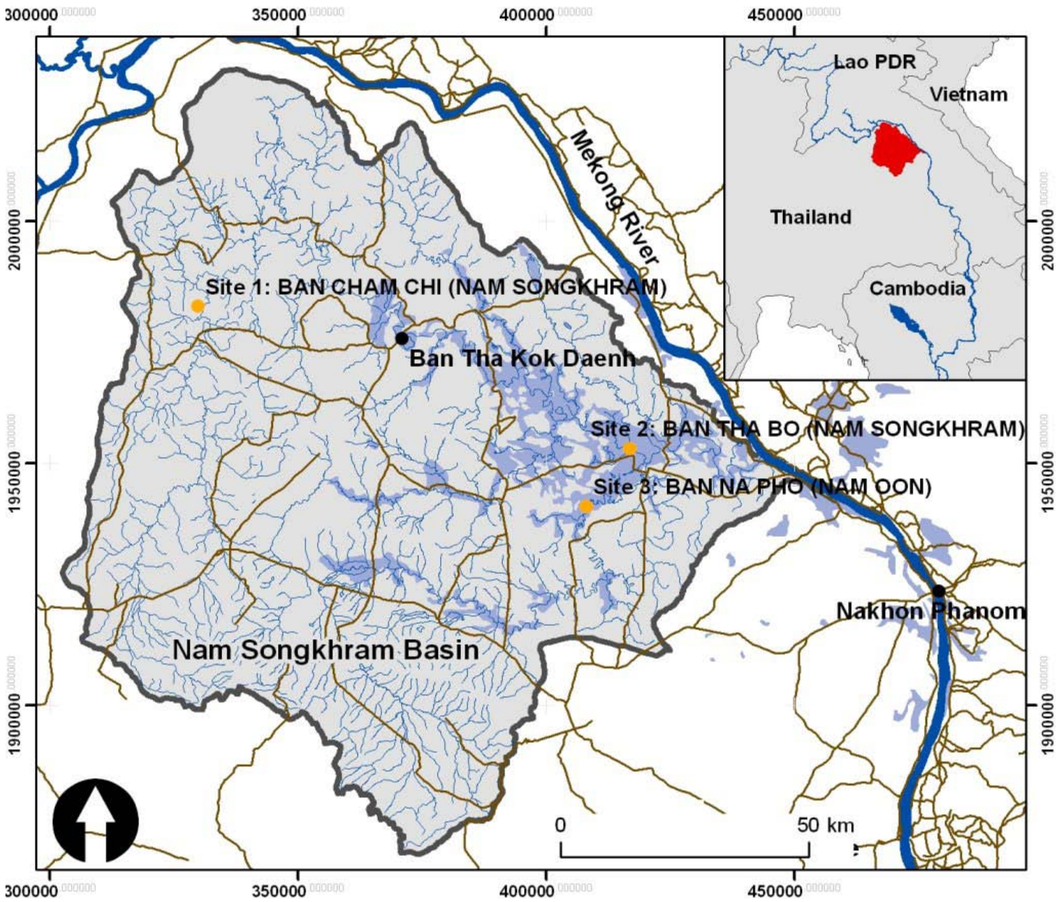

Figure 1. Location of the study sites.

Site 3. Tributary river in Lower Songkhram Basin
Nam Oon River floodplain to the north of Ban Na Pho Noi, Na Waa District (Nakhon Phanom) (Grid Reference: 48Q 040 9676 - UTM 194 0404)

Nam Oon is the second largest sub-basin of Nam Songkhram, covering an area of 356,570 ha. It features a broad floodplain with areas of remnant seasonally flooded forest, but much land has been cleared for agriculture in the last two decades. There has also been much recent disturbance of the site by ditch and dyke construction for irrigation in the lower floodplain. Some natural floodplain wetland habitats remain, including ox-bow lakes, channels and riverine sandbars with distinctive vegetative communities. River hydrology has been radically altered by an upstream large storage reservoir and irrigation scheme. The village is situated on elevated land about 1 km south of the river.

Outputs

Box 5 The principle outputs for the E-Flows process

Stakeholder consultations*.* These were a series of formal and informal meetings with various institutional partners that were held early in the process and during implementation to initially assess interest and opinion on conducting an E-Flows study in the Nam Songkhram Basin and to help guide the approach. This led to an active exchange of information and strengthening of understanding about E-Flows, while identifying potential project partners and participants in the E-Flows assessment.

Field assessments*.* These were planned to take place during the periods of maximum rainy season flow (Aug/Sept) and minimum dry season flow (March), using a multi-disciplinary team of specialists from a range of local and regional institutes. The majority of specialists were Thai.

Scenario-based workshop**.** This was held in early May 2007, after the results of the field assessments had been completed. It was designed to strengthen understanding amongst the E-Flows Team about the cross-disciplinary relevance of the findings and to consider a range of possible future development scenarios.

Multi-stakeholder meeting*.* This was conducted in late May 2007 to bring together for dialogue some of the key actors (state and non-state) concerned with water and natural resources management in the four provinces of the Nam Songkhram Basin. Informed by specialist findings from the E-Flows field assessment and the scenarios workshop, the emphasis of the meeting was on constructive dialogue to explore better development outcomes.

Awareness-raising*.* The E-Flows project component of WANI produced a limited set of posters and brochures in Thai and English languages to distribute to project partners and local institutions to raise awareness of the concept and practice of E-Flows, guided by the case study example of Nam Songkhram Basin.

Report of findings. This is a compilation of findings and lessons from the implementation of the entire Nam Songkhram E-Flows process produced for the benefit of stakeholders, donors and others interested in implementing E-Flows

Section 4: Field Study Findings

After the completion of the field investigations in both the wet and dry seasons in 2006, the disciplinary specialists submitted reports, which are summarized here.

The six disciplines covered in the study were 1) hydrology, 2) fisheries and aquatic resources 3) land use and agriculture 4) vegetation and 5) socio-economic aspects. Fisheries and aquatic resources are combined in the second part of this section. Each part provides an introduction and a summary of the main findings with some discussion. (The study background, methodology and other relevant details are provided in Annex 3 Field Study Details related to Sec 4.)

1. Hydrology

Juha Sarkkula, Noora Veijalainen, Matti Kummu, Hannu Lauri, Jorma Koponen

Introduction

The E-Flows study was linked to work providing data and information from a wider WUP-FIN project on hydrological modelling and socio-economic surveys in various parts of the Lower Mekong Basin. This involved cooperation between MRCS, the Thailand National Mekong Committee (TNMC). This study of the Nam Songkhram also included cooperation with several Thai state agencies[10].

Of great importance to this study were the relationship between the basin and the Mekong River mainstream, and especially the phenomenon of the reverse flow of Mekong waters upstream into the Nam Songkhram and the subsequent inundation of an ecologically and socio-economically important floodplain. Related to this are findings of the importance of the “flood pulse,” or the relationship between terrestrial and aquatic environments in a dynamic system of low and high water periods. The Nam Songkhram ecosystem is well described by the flood pulse concept, where the annual monsoon floods, following the Mekong mainstream water level, sustain the productivity of the basin (see Box xx the flood pulse).

Dominance of Mekong mainstream on floodplain water levels

An important hydrological process in the basin is the reverse flow of the Nam Songkhram River during high flows of the mainstream Mekong River. The effect of the Mekong water level and reverse flow up the Nam Songkhram were studied with the EIA 3D model. In the model simulations, the Mekong water level had a large effect on the extent and depth of the flood in the lower Nam Songkhram basin (please see hydrology section in Annex 3 for modeling figures, maps and other details).

The study noted that one of the main outcomes from the Mekong River’s influence was a pronounced backwater effect; reverse flows also occurred, where the Mekong waters flow into the Nam Songkhram basin. These occurred in the simulations nearly every year to some extent. During the largest reverse flow events, water from the Mekong flowed as far upstream as the large floodplain of the lower Nam Songkhram. The reverse flow lasted on

[10] All WUP-FIN reports and other project information can be uploaded from their website address: www.eia.fi/wup-fin

average for 4-9 days, the largest volume occurring during the early period of rising floods i.e. most commonly in July.

The water level in the floodplain is thus regulated by the water level in the Mekong mainstream; the water level in the Mekong mainstream plotted against water level in the floodplain transects closely track each other. Consequently, any development in the upstream Nam Songkhram River would not significantly impact on the water levels in the Songkhram floodplains (see also Sec 6 Scenarios that decribes the situation related to upstream development plans).

Conclusions

The main hydrology findings address two major phenomenon: the Mekong mainstream flood levels and the basin flood pulse. The water level in the floodplain is fully controlled by the water level in the Mekong mainstream. Therefore, upstream flood protection does not appear to have significant impact on flood in the floodplain. Moreover, the annual flood pulse is the dominant feature of the hydrology in the Mekong basin. The flood pulse (terrestrial and aquatic phases) of the Nam Songkhram River is extremely important for the productivity of all the aquatic ecosystems in the basin as it sustains the floodplain ecosystem and the fisheries that local communities depend upon.

2. Fisheries and Aquatic Resources

Ubonrattana Suntornratana

Introduction

Of the more than 30 major river systems in Thailand, the Nam ☐Songkhram is one of the best known for its impressive wild capture fisheries in the river and its tributaries as well as its extensive seasonally inundated wetlands. Freshwater fisheries in Thailand generally do not have a long history of detailed and systematic data collection by state agencies and large gaps remain in the knowledge base (Coates, 2002). The Nam Songkhram river is something of an exception in this regard, however, given the importance of its inland fisheries to local communities, not only as a means to access common-pool resources for livelihood benefits, but also in representing a traditional way of life and the cultural identity of the people in the river basin. Hortle and Suntornratana (2008) reported that more than 60% of households are involved in the capture fishery to some degree, while more than 40% of village headmen indicated that capture fisheries were important in their villages as a source of food and income.

The Nam Songkhram Basin-Mekong connectivity

The close connection between the Lower Nam Songkhram Basin wetlands with the Mekong mainstream allows bi-directional migration of fish and other aquatic organisms, ensuring completion of life cycles and a high aquatic biodiversity (Suntornratana et al, 2002). Although migratory behaviour will vary from species to species, all are likely influenced to some degree by the hydrological flow regimes of both rivers. Local fishers report that the start of the upstream migration coincides with the early period of the wet season, while the main downstream migration occurs at the end of the wet season when water levels are receding. Adult fish and juveniles that have benefited from the rich feeding grounds of the inundated floodplain move off the floodplain towards the mainstream river and perennial water sources. As a result of this, the latter part of the wet season tends to be the period of greatest fishery production and activity (for more details please see Annex 3 on Fisheries and Aquatic Resources).

The degree of flow connectivity between the Mekong mainstream and the Lower Nam Songkhram Basin floodplain system has contributed towards the level of fish biodiversity found in the area. Surveys conducted by Thailand's Department of Fisheries found that there are at least 188 species representing 30 families found in the Nam Songkhram Basin. Average standing crop recorded by one study was 90.8 kg/ha ± 60.1 kg/ha (Yingcharoen and Virapat, 1998), while a later baseline fisheries study estimated catches in the lower part of the Nam Songkhram Basin could be over 34,000 tonnes per annum and mean yield per unit area to be 78.9 kh/ha (Hortle and Suntornratana, 2008).

There are more than a hundred species of fish in the Nam Songkhram Basin that display distinctive life cycles, which depend on a range of habitat types for completion. While some species are highly sensitive to environmental changes, others are more tolerant and adaptable to change. However, both migratory and local resident species require healthy ecosystems and flow patterns to survive and reproduce. The range of available habitats for fish can provide a good indicator of the overall health of a riverine ecosystem, such as that of the Nam Songkhram.

Conclusions

1. Overall the lower part of Songkhram river is still a functional floodplain system, as indicated by a diverse fish fauna and presence of a variety of other aquatic animals. The natural seasonal flood greatly expands the aquatic habitat area in the wet season allowing fish access to abundant food sources, while remnant flooded forest habitat helps to decrease competition and predation of young fish. It has also been mentioned in some studies that young fish prefer to live not too far from the main riverine channels (Suntornratana et al, 2002; Hortle and Suntornratana), therefore, fertile flooded bamboo forest that is scattered along the Nam Songkhram riverbanks in the middle and lower reaches is a critical habitat for fisheries production.
2. The Songkhram River is still regarded as a productive floodplain area for aquatic resources including fisheries production. Information gathered during discussions with the local inhabitants/communities and also information extracted from various studies indicate that fisheries is still an important sector of the rural economy, especially in the lower parts of the river system. Many local communities still depend on fishing and fish processing activities for food and income. Despite external economic forces leading to habitat degradation and changes in landuse, the overall fisheries productivity has remained relatively good, probably as a result of the continued annual flood cycle. From the fisheries perspective, it is essential to maintain the natural flood and flow patterns which help maintain aquatic biodiversity and bioproductivity in the system.
3. While the present situation in the Songkhram River Basin shows rapid degradation of important inundated wetland habitats, especially the decline of bamboo dominated seasonally flooded forest noted at Sites 1 and 3. This has almost certainly affected the stocks and abundance of fish fauna, especially certain Mekong fish species. Many fish species dependent on seasonally flooded forest may become locally extinct as they lose access to important spawning and feeding ground areas.
4. From field observations, the environmental condition of the lower mainstream Songkhram indicated that the flow regime still remained in a relatively natural condition compared to the Nam Oon, where flows were regulated by operation of the upstream Nam Oon Dam. There were daily fluctuations of water level in the Nam Oon during the dry season study when the dam is operated for dry season irrigation.

This unnatural flow pattern may generate impacts on many fish species and also affect the triggering of seasonal fish movements for reproduction. In addition, the water released from the Nam Oon reservoir downstream is clear water and thus has a high capacity to erode and carry sediment, which subsequently results in a high turbidity, reduction in light penetration and loss of critical marginal habitat for fish fauna. However, during the peak flood period in the wet season, both the Songkhram and Nam Oon become part of a common river and floodplain system, largely unaffected by upstream developments.

5. Changing natural flow regimes and cumulative effects of obstacles may cause migration or fish movement delay. The impacts will be both during migratory species migration upstream for reproduction and the downstream migratory period. Fish moving upstream to spawn will have limited energy supplies as they are heavy with eggs and will not be feeding heavily. Therefore, migration delay due to encountering obstacles or unnatural flow changes will affect the fish's physiology and reduce its ability to reproduce. Downstream migration for young fishes may also be delayed and may affect them reaching fertile nursing ground habitat. Certain structures, like the Nong Gaa Weir, Ban Dung District, will be total physical barriers to upstream fish migration in all but flood conditions. This structure, located just upstream of Site 1 is likely to have had impacts not just on longitudinal migrations up and downstream, but also lateral migrations on to and off the floodplain, due to the construction of raised embankments running for several kilometers upstream of the dam structure itself. These will likely have fundamentally changed the aquatic ecology and species diversity of this stretch of the river due to habitat simplification and degradation.
6. The E-Flows approach has mostly focused on determining the present status of river-floodplain system and the linkages between different sectors, especially the ecological and social aspects. For a fishery specialist, this approach can help support a better analysis and appreciation of the complex relationships between the aquatic ecosystems and their diverse use by humans for fisheries and other sectors.

3. Land use and Agriculture

Mongkhon Ta-oun

Background

The land use and agriculture assessment study was broadly aimed at identifying critical land and water use patterns and assess the degree to which communities depend on floodplain water resources for their agricultural activities. The majority of people in the Nam Songkhram River Basin are presently involved in rice cultivation to some degree, although for communities near the floodplain, rice cultivation has always been a risky activity in the rainy season due to seasonal floods; most effort was traditionally concentrated on cultivating alluvial terraces, where flooding was less of a threat to harvests. Both anecdotal and written evidence show that up until thirty years or so ago most villagers in the Lower Nam Songkhram River Basin depended on limited subsistence agriculture, with a heavy reliance on exchange and barter of wild wetlands products to secure rice and have only recently turned to commercial agriculture as a means of livelihood (Blake and Pitakthepsombut, 2006).

As the region opened up and villagers entered the market economy, people gradually cleared forests for planting cash crops such as cassava, sugar cane and jute, especially on upland soils. Recently many villagers have switched to several new activities such as eucalyptus and para-rubber plantations, to partially replace rice cultivation and annual cash crops. This was apparent in nearly all villages in the parts of the Nam Songkhram Basin visited by the E-Flows team. The fieldwork was able to ascertain the current agricultural situation of the Nam Songkhram River Basin and identify the main soil types of the agricultural areas.

Overview of the study sites

Site 1) Upper part of the Songkhram River Basin, Baan Kham Chi, Udom-porn Sub-District, Fao Rai District, Nongkhai Province. Udom-porn Sub-district has 13 villages. Much of the agriculture is rainfed and the majority of the farmers are rice growers.

Site 2) Lower Part of the Songkhram River Basin near Ban Tha Bor, Tha Bor Songkhram Sub-district, Sri Songkhram District, Nakon Phanom Province. The majority of the farmers in Tha Bor Songkhram Sub-district are primarily rice growers, while orchards and cash crops are relatively scarce due to the local lowland topography and risk of flood inundation.

Site 3) Lower reaches of the Nam Oon River, Ban Na Pho Noi, Pon Sawang Sub-District, Sri Songkhram District, Nakon Phanom Province. In 2005, rainfed rice fields predominated in this sub-district, covering an area of 2,150 ha or 86.52%, involving 956 out of the total 1,052 families practicing rice cultivation. In the last few years, observations show that both eucalyptus and rubber are expanding in the sub-district, apparently due to perceived good prices. (For more details on methodology and the study sites please see Annex 3 on Land use and Agriculture).

Land use changes in the Nam Songkhram river basin between the rainy and dry seasons (2006-2007)

The Songkhram River Basin land use utilization is similar to other areas of Northeast Thailand where new cash crops are replacing traditional cash crops (like cassava and sugarcane) grown since the push for export-led agro-industry expansion started in the 1960's, leading to massive deforestation across the region. The study of land utilization changes effects on the local economy, environment and society, from the site survey and local interviews, may be broadly classified as follows (for more details See land use changes section in Annex 3):

1. Wetland changes from seasonally inundated forest to dry season irrigated rice

The site visits in August/September 2006 and March 2007 including both bio-physical survey work and villager interviews found that the degree of wetland alteration was most severe at Site 1, followed by Site 3, with Site 2 (Ban Tha Bor) showing least alteration. At both sites 1 and 3 , the team witnessed active and on-going forest clearance and conversion to eucalyptus plantations (Site 1) or paddy fields (Site 3) during the 2006-07 dry season. At the same time, there is serious degradation apparent at all sites, but Site 2 still has some significant areas of seasonally inundated forest remaining bordering the Songkhram River on both banks and alongside Huay Sing stream.

The bamboo-dominated seasonally inundated forest which is the commonest natural wetland vegetation type found in the Nam Songkhram River Basin is being cleared at present in order to open land for dry season rice cultivation, chiefly as a result of the these key factors: 1. High prices of rice in 2006/07 especially demand from Vietnam and China; higher yields from the dry season crop compared to the west season crop; increased availability of tractors in the village has eased conversion of seasonally flooded forest to paddy land with bunds; policy inducements and perverse subsidies such as indirect funding from various state agency sources to support the conversion of seasonally flooded forest into paddy fields, in-line with central government policy and large budgets with local Sub-

District Administration Organisations (TAO) to implement irrigated rice projects and encourage flooded forest conversion to agriculture

2. Soil erosion along the Songkhram riverbanks caused by encroachment and destruction of seasonally flooded forest

The majority of farmers pointed to deforestation of seasonally flooded forest as a cause in recent years for the drying up of the river and collapse of its riverbanks. Higher encroachment, agricultural conversion and over-utilization is leading to a dearth of mature bamboo plants in this area.

3. Protection and conservation of the bamboo forest in the Nam Songkram river basin wetlands

Site 2 has introduced more wetland protection and conservation measures than the other two sites, through the efforts of local villagers and supporting organizations – such as demarcating and classifying the wetland conservation areas (e.g. flooded forest bordering Huay Sing) – that may have helped to reduce conversion of land to agriculture in recent years.

Ongoing changes in agricultural land use

The Nam Songkhram river basin has been undergoing two major changes: change from upland cash crops to other uses and the alteration of upland and lowland fields into eucalyptus forest.

In the early 1980s, agricultural land utilization was almost all cassava and sugarcane cultivation on the upper terrace soils of the Songkhram Basin. But both these crops have seen a general decline in relative profitability and productivity over the last few decades. Presently, large areas of former cash crop land are being converted to eucalyptus plantations, especially at Site 1, but also at Site 2 to a lesser extent (See more details in the next section on. At Site 3, para rubber trees predominate over eucalyptus as there is more upland terraces available. By 2005-2006, most families were growing eucalyptus trees on their land and some farmers have converted over 50% of their land holding, including paddy fields, into eucalyptus plantation which poses uncertainties for food security in these villages in the future.

Vegetable cultivation in dry season or cash crops after rice harvest

It was found that at Site 2 near Ban Tha Bor, around 7-8 households were involved in the cultivation of dry season intensive watermelon and vegetables, while at Site 3 there was some limited maize and vegetable cultivation near the Nam Oon river. By contrast, at Site 1 there was only limited cropping with the exception of some small scale growing by farm ponds and one elderly farmer growing sweet potato on the Nam Songkhram riverbanks.

Problems of saline soil

The Nam Songkhram Basin is underlain with extensive salt deposits, which in some places rise to near the surface and may be exploited commercially, such as in parts of Ban Dung District, Udon Thani and Wanon Niwat District, Sakhon Nakhon. Locally, saline soil or underground water sources is a problem at many locations throughout the basin. The survey team found that underground rock salt had risen to the surface forming patches of surface crust of salt at Site 3 (Ban Na Pho Noi), near to the Nong Paen Reservoir, but was limited to a small area. This may be related to rises in water table caused by the reservoir, bringing salt to the surface through capillary action.

Migration of agricultural labor

There is active labor migration to urban areas such as Bangkok, Rayong, Chonburi, Phuket, and also abroad (e.g. Singapore), particularly by teenagers and young adults in all three study sites. This encourages switches from small to larger tractors for ploughing or from rice to eucalyptus plantations, for instance. This in turn decreases the need for local labor and further out-migration occurs in a vicious cycle. People who return from living in the city tend to want quick profits and easy returns on money and labor invested, with little time for soil and water conservation techniques or care for the natural environment. However, initiatives like the Tai Baan Research that was carried out in Ban Tha Bor (Site 2) and other villages in Sri Songkhram District, show that there is still interest in protecting natural resources and maintaining or reviving traditional livelihood practices and patterns amongst many village residents (Tai Baan Research Network of the Lower Songkhram River Basin, 2005).

Conclusion: Agricultural land usage priorities in the Songkhram River Basin

The land use priorities of farmers in the Songkhram River Basin have changed over time, predominantly in response to wider socio-economic changes. Currently farmers are switching attention from farming not only raised terrace lands, but transforming the floodplain areas previously considered common property land of little agricultural value. These areas were formerly chiefly used for fishing, gathering NTFPs and livestock grazing, while paddy fields were mostly found on elevated lands above the regular flood level. But as population pressure has increased and land prices have risen, people have cleared more floodplain land and practiced "*naa siang*" (literally means "risky rice cultivation"). This practice has been encouraged by government policy, which granted cash compensation to villagers who lost crops to flooding, even when the causes were totally natural, by declaring the floods as "natural disasters".

Other policies which have encouraged the conversion and massive clearance of seasonally flooded forest to rice fields, has been the strong emphasis placed by many state agencies on irrigated dry season rice cultivation with generous subsidies given for irrigation infrastructure construction, the land reform policies of ALRO and long standing misclassification of floodplain forests as "vacant wasteland" or "degraded scrubland" and general lack of recognition of the value of natural wetlands by nearly all state agencies. In recent years, these policies have been compounded by the growth in power and influence of the pulp and paper industry, which has helped encourage villagers to plant eucalyptus on both upland and floodplain lands. Additionally, promotion of rubber growing in the upper Northeast by state agencies has led to wide adoption of rubber by a majority of farmers in some wetland marginal villages (e.g. Ban Kham Chi) in a relatively short period of time.

4. Vegetation
Pattaraporn Waleetorncheepsawat

Introduction

The seasonally flooded forest (*paa boong paa thaam*) has been previously identified as having most value and significance to local livelihoods, partly due to the variety of useful flora found within it and partly due to the role it plays as a source of fish and aquatic products in the flood season and during the flood recession (Blake and Pitakethepsombut, 2006; Khonchantet, 2007). In a ten village socio-economic study of seasonally flooded forest community use, Khonchantet (2007) estimated that the average contribution of wetland products to villager's income was 38,403 Baht/household/year of which 3.54 %, 18.16 %, 4.21 % and 19.11 % were made up of wild vegetables, edible mushrooms, bamboo shoots and livestock fodder components respectively. However, it is recognized that the seasonally flooded forest is in a much degraded state both quantitatively and qualitatively.

This report, combining wet and dry season data, tries to illuminate the past and present status of the floodplain vegetation to identify some of the linkages between plants and other disciplines, in particular hydrology and landuse. It also considers briefly the impacts that some of the gross ecological changes might have had on the health of the overall ecosystem, including threats from introduced alien species, flow regime changes and land use changes. Lastly, it presents one or two recommendations for further study in the Nam Songkhram Basin.

Vegetational Habitats

The principle vegetational habitat features of the three field sites were as follows:

Site 1:Ban Kham Chi floodplain transect line (one km long) exhibited a floodplain covered by patches of bamboo-dominated seasonally inundated forest (*paa boong paa thaam*), agricultural land (rice fields and some sugar cane), young (< 5 years) eucalyptus plantations and the Nam Songkhram river channel with steep banks on which grow a mixture of remnant trees and annual herbs and grasses visible in dry season only.

Site 2:Ban Tha Bor floodplain transect line (5 kms long) included mostly bamboo-dominated seasonally inundated forest, some agricultural land (paddy fields), eucalyptus plantations and the Songkham river channel, plus two backwater channels namely *Huay Sing* and *Wang Wai which are natural features but made into permanent water courses by small dams being built across the outlets.*

Site 3:Ban Naa Pho Noi floodplain transect line (3.9 kms long) included a mix of seasonally flooded forest (bamboo and dense scrub forest), newly converted agricultural land (irrigated and non-irrigated rice fields), young (< 3 years) eucalyptus plantations and the Nam Oon river, plus two semi-natural floodplain backwater channels-cum-reservoirs namely *Kud Khae* and *Nong Paen*.

Conclusions

The Nam Songkhram river floodplain's native vegetation cover would appear to be represented by plant communities that normally grow rapidly in the dry season, followed by a period of slower growth during the wet season flood period in a successional pattern of growth. When the wet season arrives some plant growth activities will stop temporarily or some members of the community will die-off, as they cannot tolerate the prolonged flooding period. An exception to this general pattern is the ubiquitous flood-tolerant bamboo (*Bambusa* spp.), which grows rapidly when the rainy season starts with shoots out-pacing the rising flood water to present greenery year round, even when the floodplain is under 4 – 5 metres depth of water. This remarkable trait of the bamboo plants to both tolerate floods and still send up edible and nutritious shoots well into the dry season, has helped them to being an important component of local livelihoods. Then, as the water level subsides at the start of the dry season the same plant community with some new pioneer members will reinitiate growth. This pattern is called a cyclical succession. The cycle begins with a pioneer phase of seed germination and then moves through several stages sequentially before finally returning to the original state. So, part of the community is impermanent or annual and the rest are flood hardy perennial species that can tolerate up to five months submersion with no ill effects (Utit, 2001). As a result of this successional pattern and habitat diversity, the ecosystem exhibits high plant diversity, structural complexity and resilience.

5. Socio-economic aspects

Dr Buapan Promphakping

Background

The vibrant and complex socio-economic patterns seen in lowland parts of the Songkhram River Basin have largely depended in the past on wild fishery production and use of natural resources from inundated floodplains. Natural flow regimes and abundant natural resources ensured livelihood security and contributed to the cultural values of riverine communities in the region. The communities to a significant extent adapted their livelihoods to the floodplain environment and many traditional resource utilization patterns reflected the natural flow patterns and ecosystem of the Nam Songkhram River. The natural wealth of the riverine floodplain was one of the most important factors that attracted people to live in the region. As the agricultural frontier expanded and the area was opened up to improved communications and new development opportunities, people from other provinces of Northeast Thailand moved into wetlands communities to exploit the locally abundant resources.

Adaptation and willingness to change according to external factors has always been a feature of Northeastern Thai communities. Various periods of natural resource usage pattern were noted by Blake and Pitakthepsombut (2006), who suggested there were three main eras identifiable in the Nam Songkhram Basin, namely an Era of Trade in Freshwater Fish, Logging Concessions and Commercial Charcoal Burning (1957-1977); an Era of Agricultural Development and Expansion of Agribusiness (1977-1997); and an Era of Industrial Tree Plantation Expansion (1997 onwards). Moreover, in the past decade or so, usage of the natural resources by communities has started to fundamentally change, influenced by many drivers including commodification of nearly all natural resources, labor out-migration, rural development and state policies.

Socio-economic changes in the community and changes in floodplain resources

The study revealed that socio-economic aspects of the Nam Songkhram River Basin rural society were formerly characterized by a largely subsistence-based local economy that started to be commoditized in the 1960's.

Over the past 25 years, a number of changes related to degradation of floodplain resources were observed or reported to the researchers. First, there was massive forest clearance in the village peripheries, both on the floodplain and on upland terraces. The rate of removal of logs and tree stumps from the riverbanks and surrounding floodplain, which had previously provided varied habitat for fish, increased as the price of hardwood increased.

Second, dry season rice growing has rapidly expanded, primarily into floodplain areas. This has been happening in conjunction with construction of water infrastructure on the floodplain. The justification given for building these water resources was to store water for dry season rice growing, although we found many not able to fulfill this function. Although these water sources are frequently under-utilized, plans to build more water resources by both local and central government agencies abound. These plans are usually driven by claims of drought and water shortage for dry season rice farmers.

Third, the economy of the three communities over the past three decades has been primarily dependent on external income sources and factors. Out-migration is found to be common across the three communities, reversing the earlier trend of in-migration. Mobility and consumption patterns in rural villages now more closely reflect the wider socio-economic patterns of urban Thailand than in years gone by.

It should be noted that the growing importance of the external economy and out-migration in these villages has likely eased some pressure on the floodplain resources, i.e. fish and non-timber forest products (NTFP's). However, from our observations the use of floodplain resources still remains high, partly due to the fact that fish and NTFP's have been further commoditised. These resources are not only used to satisfy basic household food needs, but have increasingly become a source of income for many households. This coupled with a growing demand for wild products by urban markets and an almost complete switch to a cash economy, has intensified use of floodplain resources.

Fourth, is the widespread presence of agribusiness in the Lower Songkhram River Basin and its occupation of vast areas of floodplain land. In Ban Tha Bor, villagers reported that the SunTech Company Ltd dishonestly obtained former publically-owned wetlands by conspiring with local state officials. Later, the company approached the villagers and offered them a sum of money in exchange for the land rights. The majority of villagers accepted this offer, although official documentation of this land had not yet been undertaken. Similar cases have occurred in Ban Na Pho and Ban Don Daeng, Sri Songkhram District (close to Site 2). Villages reported the heavy use of pesticides and chemical fertilizer, as well as constant conflicts between villagers and the company about land ownership and right of access, for example to fish or raise livestock on the floodplain.

Invasion of a new tree species: Eucalyptus
Increasingly villagers have chosen agricultural activities, techniques or crops with low labor requirements, including non-food cash crops such as eucalyptus and rubber plantations. The changes in socio-economic conditions hasmeant that labor for agricultural work became scarce over time. At the same time, remittances from outside often do not meet a family's financial needs and agricultural activities continue, especially for rice cultivation.

The expansion of eucalyptus cultivation in all three villages has been quite a recent phenomenon, although it has actually been promoted locally for more than two decades. The promotion of this alien species tree crop has been controversial, especially the issue of environmental impacts. Eucalyptus has been widely adopted for the specific reason that it can tolerate flooding better than most other crops and so is considered suitable for growing on the Songkhram floodplain. Moreover, growing eucalyptus requires minimal labor input after planting. In the 2007 dry season study, we observed vast areas in Ban Na Pho had recently been cleared since the recession of the last flood. According to one study in Ban Tha Bor, more than 40 percent of the households grow eucalyptus, with plantations on the floodplain (Srisuno, 2006) (see also previous section on land-use).

Institutional dimensions

Land and property rights

Beginning from the broad topic of floodplain resources (forest, land, water, fishery, etc.) governance, one of the primary considerations is the property rights regimes and their evolution over time. In the recent past wetland forests, floodplain land and the river itself were considered as open access resources by local people. The abundance of these resources and their mostly subsistence-level use meant that limitations on resource use was considered unnecessary. Scarcity and over-harvesting of these resources were not an issue in the minds of villagers. Although there were cultural practices constraining some use of natural resources, as mentioned earlier, these were mainly to protect social cohesion, rather than the natural resources.

Changes in the property right regimes governing the use of floodplain resources have been primarily driven by socio-economic changes. First, in Ban Kham Chi migration into the village during the 1960s resulted in a growing scarcity of upper terrace land and wild natural resources such as timber trees and wildlife. Consequently, occupation of land gradually expanded downslope onto riverine floodplains, held by local (formal) leaders – previous village headman and *kamnan* (Sub-District chiefs).

Similar processes also occurred in Ban Tha Bor and Ban Naa Pho, but an agribusiness company advanced the privatization of land in the case of the former. Although the process of land documentation for floodplain land claims has not yet been officially completed, the trend of common land privatization has continued. Agribusiness companies hold vast tracts of land, while villagers claim rights on smaller plots of surrounding lands, with disputes common.

It should be noted here that in the LSRB, the state has widely issued *Sor Por Kor* documents to villagers. This was justified principally as an attempt to solve the problem of 'having no farmland to earn a living' but in the case of the Nam Songkhram floodplain, ironically, most plots were left unused for agriculture until recently because of annual flooding rendering them unsuitable for wet season rice. At the same time, lack of irrigation infrastructure and extension support left them unsuitable for dry season rice, despite several failed attempts. Additionally, the state has over the past few years introduced a compensation scheme for farmers who are affected by natural disasters. Flooding is regarded as a "natural disaster" (*utokapai*) no matter its actual causes, but in order to claim compensation the villagers must grow rice on the floodplain land they own, despite knowing the high probability that the crop will be damaged or destroyed by flood. The privatization of land is closely associated with the depletion of floodplain resources, especially the clearance of land to grow eucalyptus, as described above.

Local institutions

a) Community institutions

In general, there is scarce evidence for an active role by community institutions pertaining to floodplain resources. Beliefs in supernatural forces related to floodplain resources used to exist but have evidently weakened or virtually disappeared. In Ban Kham Chi, the villagers reported that there was a belief in a local guardian spirit known as *Ta Poo* of Kham Chi (ancestral spirit of a natural spring on a Songkhram tributary which gave the village its name). This belief stipulated that the use of natural resources, especially fish, must be conducted in a particular way. However, the belief in *Ta Poo* of Kham Chi has declined with the former spirit house for *Ta Poo* being moved from its old site by the stream to a new site located near the village, apparently for convenience's sake.

Ban Tha Bor temple has played a lead role in demarcating and managing a 'sanctuary compound' (*khet apai than*), – an area prohibiting all forms of killing and hunting. This includes a protected area located in the main channel of the Nam Songkhram River in front of the temple prohibiting all fishing. A semi-protected 'Community Forest' area is located along the Huay Sing stream of Ban Tha Bor which villagers co-manage and have recently

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started some reforestation activity. But these areas are relatively small compared with the overall size of the critical floodplain area.

One important institutional aspect involves the rules and regulations of the community pertaining to water bodies. It was noted that the implementation and actions of these institutions varies considerably. The actions of each community to limit use of the river, especially control of the use of different types of fishing gear was generally unclear. More manifest were regulations concerned with natural swamps, reservoirs and other types of small waterbody connected to the main river. These water sources are located on the floodplain and will be inundated during floods.

b) State agencies and local government

Actions of state agencies may either limit or encourage use of floodplain resources. Government agencies concerned with floodplain resources include the former Department of Energy Development and Promotion (DEDP), Department of Land Development, Royal Irrigation Department (RID), Department of Land Registration, Tambon Administrative Organization (TAO) and Provincial Administrative Organization (PAO). These state agencies tend to implement projects – mostly related to water infrastructure – using their own budget and expertise usually engaging in minimal consultation with local people, except for local government agencies.

c) Community Organization and Environmental Associations

There are several kinds of community organizations existing in the villages. These organizations were both initiated and funded by state and non-state organizations. There are farmer associations, occupational groups, women's groups, credit groups (e.g. One Million Baht Village Fund scheme of the Thaksin government), child care groups, etc. However, none of these play a direct role related to governing the use of floodplain resources. An exception might be a community organization in Ban Tha Bor, where an NGO is presently working with the villagers. The community organizations are managing community forestry, village (temple) sanctuaries, and coordinating with NGO's (and state agencies), in studying floodplain resources and initiating activities that may lead to the wise use of floodplain resources.

Resource user groups

The socio-economic analysis from both the wet and dry seasons suggests that floodplain resources have become less important as the economy of these communities has been gradually oriented towards the outside market. However, the following resources still remain relatively important to certain groups, which will be discussed below.

a) Fishers

Fishing is far more important to local livelihoods in Ban Tha Bor than the other two villages. This is primarily due to the bio-physical location of the village being located in 'the heart' of the floodplain – where the floodplain extends to its widest point in the LSRB; Although people have been increasingly earning a living from employment outside the village in recent decades, fishing continues to play an important role for the household economy of many families. By comparison fishing in the other two villages is far less important and has declined as a main form of livelihood and tends to be regarded as a 'supplementary' activity for most villagers.

b) Non-timber forest product (NTFP) collectors

Villagers of the three villages identified several NTFP's available in the floodplain that are frequently gathered. Villagers use these resources for domestic consumption mostly, with few households in the three villages reported earning income from NTFP's. Bamboo shoots and several kinds of wild vegetables were ranked highly, usually second only to fish. It was noted that older villagers firmly preferred the taste of wild vegetables and natural foods to the less fresh and "pesticide laced" cultivated vegetables found in the markets.

c) Rice farmers

Most of the villagers in three villages are part-time rice farmers, although not all of them grow rice on the floodplain. Over the past two decades, the state has heavily promoted dry season rice farming. This has occurred alongside widespread construction of water infrastructure, especially the construction of weirs, reservoirs, embankments and dredging of streams and channels by the state agencies. The modification of the floodplain has affected the floodplain natural resources.

d) Eucalyptus growers
The factors driving eucalyptus plantation rapid spread across the Basin have been briefly discussed above. Eucalyptus cultivation in the three villages has been primarily driven by the demands of the pulp and paper industry, through local agents, including state officials. The strategy of the pulp and paper industry is slightly different from intensive cash crop agribusinesses in that it does not seek to obtain land and grow the trees on its own land. Instead, the businesses involved aim to promote small farmers to produce raw material for supplying the industry, thus reducing risks and overhead costs associated with land acquisition. The rapidly growing number of farmers growing eucalyptus means a stable source of supply to the factories for several years to come, plus a lower price of raw material.

e) Agro-industry
Agro-industry appeared in the LSRB about three decades ago, by obtaining large plots of land on the floodplain from local villagers that had formerly been public land. The industry initially concentrated on growing intensive vegetable crops (e.g. tomato, sweetcorn) for supplying factories for export from their own farms, but later also promoted the growing of the same crops by local farmers. Agribusiness at one time was a significant source of employment for local labor in Sri Songkhram District, as the farm, processing factory and contract farming were creating jobs about 15 years ago when the business peaked. Due to a mix of financial irregularities involving land acquisition, political interference, non-performing loans and poor competitiveness against foreign producers and macro-economic changes, the agro-industry has declined considerably in the last decade.

e) Cattle and buffalo raisers
Cattle and water buffalo are commonly found in all three villages and traditionally formed an important part of the local economy. The raising of buffalo and cattle has long been dependent on the open access floodplain forests and scrub/grasslands for animal grazing and forage resources. During the past few years with the promotion of dry season rice growing and expansion of eucalyptus plantations, grazing animals on former public land has faced increasing difficulties as the common access lands are privatized and fenced off. This has increased conflicts at the village level between livestock owners and crop growers, especially if the animals damage the crops where they once were able to freely graze.

Conclusions: Re-negotiating for the future

Changes in socio-economics of the three villages and the Nam Songkhram Basin in general are quite evident. These changes evidently affect the ecological regime of the river and floodplain. The future of the remaining *paa bung paa thaam* or floodplain forest is not good, due to many pressures.

Meanwhile, as resources have declined, local communities have gained higher mobility, higher consumption patterns and no longer rely on natural resources to the same degree as in the past People in the Songkhram Basin earn their living more and more from distant locations (out-migration), but in the meantime others increase exploitation of the resources of the floodplain through unsustainable usage patterns, in order to meet increased demands from local and distant markets. In the short run there may be growing affluence of the communities, more infrastructure construction, higher consumption patterns and a higher standard of living. But on the other hand, we also can forecast the continued erosion or even total collapse of the ecological regime.

The expansion of eucalyptus has resulted in the widespread loss of *paa bung paa thaam* (seasonally flooded forest) - replacing diverse native plant species by a single alien species in a fragile environment has as yet unknown long term consequences.

"Environmental Flows" into floodplain communities include consumer goods, money, information, novel (labor-saving) technologies such as new crop types, pesticides, insecticides, etc. Flows out from the communities and the floodplains include human labor, natural wetland products (fish, bamboo shoots, mushrooms, etc.), cash crops (e.g. rice, eucalyptus, etc) and soil nutrients (both by erosion and within the crop itself).

The future we portray here is under continual negotiation between several stakeholders with interests in the Nam Songkram Basin. But some stakeholders hold stronger leverage than others i.e., those who are supported by dominant state agencies and the market in particular. Indeed, the depletion of environmental resources may temporarily increase the affluence of the population in the Songkhram Basin as a result of perverse subsidies distorting the market, even as the larger share of natural capital or wealth of the area is transferred to the brokers of the state (e.g. construction companies or officials), agro-industry, the pulp and paper industry, etc. More importantly, the riverine environment in its entirety has hitherto been regarded as a 'resource' to be exploited in order to achieve notions of prosperity, but never counted as a legitimate 'stakeholder' or partner in itself, that requires certain minimum levels or/and types of flows to maintain it. The livelihoods and socio-economic health of the population of the Nam Songkhram River in the long run is in jeopardy, unless new paradigms of development are adopted.

Section 5: Scenarios Workshop

Introduction

One of the principal components of the E-Flows study was a scenario-building workshop in May 2006. The Scenarios Workshop was held with the purpose of bringing together the Intermediate E-Flows Assessment Team following the wet and dry season field studies to discuss their findings in relation to a number of potential "development scenarios" for the Nam Songkhram Basin. For example, there are numerous plans to build dams in the tributaries and upper reaches of the mainstream Nam Songkhram, which are claimed by the agencies promoting them to be able to "solve" flooding downstream.
The workshop provided a valuable chance to reflect on the main lessons from the field study and use them to consider alternative scenarios and assess what might potentially happen at each site on the basis of enhanced knowledge about flow changes and hydraulics. Three scenarios were selected for the workshop with reference to past development trends and socio-political considerations at national, regional and local levels. It was anticipated that the findings and conclusions of this workshop could be used to inform and influence the outcome of the Multi-Stakeholder Meeting that followed the scenario workshop. Additionally, on the last day of the workshop, a limited number of participants from various state agencies were invited to observe the proceedings and listen to preliminary findings, as a way of exposing to stakeholder scrutiny the E-Flows approach and methodology.

Future Scenarios Examined

Following discussions between the Nam Songkhram E-Flows Technical Working Group (TWG) members and various project partners, it was decided to take forward four possible scenarios for consideration at the Scenarios Workshop held in Udon Thani in May 2006. (The fourth was ultimately not considered due to time constraints.)

These were justified by taking into account several considerations: 1) the general context of the Nam Songkhram Basin, derived from background information and implementation of the MWBP Demonstration Site for last 3 + years; 2) reference to long-proposed major infrastructural projects by key water resources management stakeholders; and 3) what, if any, non-infrastructural project options could be considered as alternative ways forward for sustainable management of basin, natural resources and water resources, coinciding with general flows considerations.

With these criteria in mind, the following scenarios were conceived as potential development pathways that might be applied by water resources planners and decision-makers:

1. Nam Songkhram Dam
2. Water Grid plan
3. Business as usual
4. Alternative development paradigm

These scenarios and their implications are summarized below (please see more details in Annex 4 Scenarios).

Summary of Development Scenarios: Implications for Hydrology and Ecology

Scenario 1: **Nam Songkhram Dam (plus Nam Oon Watergate)**

Major hydrological impacts:

- Blocking of flow near river mouth
- Creation of large shallow reservoir stretching back nearly 200 kms upstream
- Some impact on stopping Mekong water flow and sediment backflow in rainy season

Major ecological impacts:

- Impact on fish migration patterns (up and downstream)
- Stillwater reservoir – change from riverine conditions and loss of flood pulse – change in Water Quality
- Loss of floodplain vegetation (*paa boong paa thaam*) to reservoir – possible WQ problems as it rots
- Change in aquatic faunal/floral community and productivity
- Possible mobilisation of salt layer underneath and raising to surface
- Irrigation impacts on fragile, low fertility, salinisation prone land
- cf impacts of Khong-Chi-Mun Project watergates

Major sociological impacts:

- Would potentially require relocation of several (upto 7) villages
- Would lose much productive agricultural land on floodplain (mostly *naa prang*)
- Loss of fish and other aquatic resources
- Loss of seasonally flooded forest common property resources
- Potential public health risks

NB: for Nam Oon Project: Ecological – hydrological impacts – similar to Nam Songkhram Project on smaller scale. WUP-FIN data indicates that flooding prevention is not possible by damming.

Scenario 2: **Water Grid development scenario**

Major hydrological impacts:

- Mainstream and tributaries further split into discrete sections by dams/weirs, blocking natural flows
- Abstraction of water for irrigation in dry season, from some localised stretches, with possible drying up of river channel.
- Other stretches may have extra flows (above natural), when little demand for irrigation or return flows from low efficiency parts
- Extra 65 cumecs pumped into system from Laotian river water transfers, causing overall higher dry season river flows in lower reaches.

Major ecological impacts:

- Change in flow patterns upsetting fish migration patterns and possible key events in fish lifecycles and migratory cues
- Loss of shallow water areas, important for some fish
- Greater erosion in dry season, causing higher sediment load and increase in turbidity. Loss of primary productivity. New conditions favors some species.
- More irrigation and intensive agriculture causing decrease in water quality, impacting sensitive fish and aquatic organisms.
- Increased soil and water salinisation. Possible risk of long-term land degradation and eventual abandonment.

- Risk of pollution events from misuse of pesticides, under increased intensive agriculture
- Where over-abstraction occurs (especially tributaries), less flow impacts sensitive species.

Major sociological impacts:

- More water competition for irrigation, may lead to increase inter-village and intra-village conflicts, as has happened in many other basins in Thailand
- Fundamental change in traditional agricultural practices to more high investment, high risk systems, will inevitably mean many farming families "fall by the wayside".
- A likely consolidation of farms by bigger, wealthier landowners and agribusiness interests. Decreased farm ownership and greater tenant or wage labor, for some seasonal operations.
- Move from rice and food crops to monocrop plantation forestry and non-food crops e.g. bio-fuels or cash crops.

Scenario 3: Business as Usual scenario

Main hydrological impacts:

- Slightly more storage capacity in tributaries, may delay onset of flows/ looding early in rainy season, but not greatly as all shallow reservoirs. The greatest impact will be in a dry year when reservoirs are unable to fill up quickly.
- Greater pumped irrigation schemes in mainstream and tributaries may cause decrease in dry season flows.
- More on-floodplain structures and infrastructure will alter local flow and flood patterns. Some increase in local flooding, esp. where more embankments are built, hindering flood recession drainage.

Main ecological impacts:

- Increased fragmentation of tributary reaches, negatively impacting fish migration patterns and cutting off critical habitat at critical times of year (note all tributaries are now dammed in their lower reaches, apart from Nam Oon)
- Almost total loss of on-floodplain natural vegetation and flooded forest, causing loss of terrestrial and aquatic biodiversity and breakdown in many critical food chains
- Less nutrient recycling through flooded forest, so overall loss of productivity to system
- Increased use of agri-chemicals, causing decline in water quality, esp. in dry season and first flushes of year.
- Rise in localised soil and water salinisation. Land abandonment in longer term.
- Greater bank erosion, turbidity and sedimentation locally. Songkhram may become shallower as pools fill up with sediment.

Main sociological impacts:

- As aquatic and terrestrial habitats are degraded and simplified, and biodiversity lost, local people are less able to rely on natural resources for livelihood (food and income), and must buy more food.
- Greater production of dry season rice – labor implications

Conclusions

While the overall workshop methodological process employed proved quite challenging to implement in practice, it was perhaps not surprising that no hard and fast conclusions could be drawn across the board of disciplines. There were certain constraints apparent such as time and specialists' familiarity with the technical terminology and complex concepts they were required to comprehend, digest with relation to their own discipline and analyse in a semi-abstract way. In the final analysis it was found that specialists were unable to complete the Ecology-Social Matrix tables according to original expectations. The Workshop did allow an interesting dialogue to develop between specialists about future outcomes under different scenarios.

A significant and interesting conclusion from the hydrology component was the finding that any attempt at regulation of the Nam Oon in its lower reaches (Scenario 2) would have a very limited impact on flood levels; according to the model, a complete absence of discharge from the Nam Songkhram river would lead to just a 10 cm decrease in the flood peak in the rainy season and just a small delay in flood arrival. This is a function of the over-riding influence of the Mekong mainstream water levels, and thus any attempt at upstream regulation of the Nam Songkhram or tributaries will have a negligible impact on flood control. The hydrology study findings (as explained earlier in Sec 4) demonstrate that no matter how much run-off of the Nam Songkhram River is held back in its upstream reservoirs, the water levels on the floodplain would not be significantly affected as they are primarily controlled by the hydrology of the Mekong mainstream.

This finding alone would tend to offer strong evidence counter to the "flood protection" justification for building water management infrastructure (including the RID Nam Oon Watergates project and Nam Songkhram Project of Scenario 1). However, the additional reality is these projects could be pushed ahead on the basis of supposed benefits for irrigation.

If this occurred Sites 2 and 3 would be essentially altered irrevocably, as they would be transformed from their present variable habitat riverine floodplain state to a permanently inundated lacustrine (reservoir) state with little habitat diversity, and consequently, less aquatic biodiversity or productivity. For Site 1, it was not clear how far upstream of the Nam Songkhram Dam's reservoir it would lie, but the Team felt it would be influenced to an extent and see fundamental changes in social and environmental parameters, although quantifying them was more difficult. While the Intermediate EFA and Scenario Workshop were not designed to be an Environmental Impact Investigation or Social Impact Investigation studies, when delving into the combinations and permutations, both temporally and spatially, that a number of plausible development scenarios presents, then it rapidly becomes apparent that the level of investigation and consideration should be deeper than the relatively narrow time frame of the Scenario Workshop. What became apparent was the complexity of the relationship between hydrology and each discipline studied, would require more in-field and secondary data analysis for the team to build up a strong understanding of the implications of the fundamental changes that would result under each of the proposed scenarios.

From the perspective of fisheries, a view was expressed that both habitat degradation and simplification were likely to be bad for fishery productivity and biodiversity, reducing was at the present time a rich and diverse fishery by Thai standards. Similarly, any alteration of flows was bound to be negative to a high proportion of local fish species, many of which rely on flow triggers to complete their life cycles at egg, juvenile and adult stages. The notion that a reservoir fishery created could replace the rich and diverse river floodplain fishery that presently exists, especially for Sites 2 and 3, was also believed to be false, based on the experience of numerous other reservoir fisheries in Thailand, irrespective of the water quality problems that may accumulate both from agricultural activity around the reservoir and natural processes of biomass decay. Vegetation and land use are intimately linked when considering the scenarios. Each development scenario tended to stress irrigated agriculture over any need to conserve natural vegetation and as was witnessed during the dry season field visit to the sites, the rate of clearance of flooded forest was rapid and on-going. The general consensus for Sites 1 and 3 was that seasonally flooded forest was probably doomed, whether by the Business-as-Usual or the Nam Songkhram Dam route, but at Site 2 (Ban Tha Bor), there was a slight hope of villagers being able to protect some limited areas of public land under flooded forest, on the assumption that the Nam Songkhram Dam is not built. The main ongoing threat here (as with Site 1) was the growing popularity of eucalyptus plantations, which were having impacts on other livelihood sectors, including livestock grazing, fisheries and rice cultivation, and identified as having potential to cause intra-community conflict in future.

While the social links to the various livelihood activities dependent on floodplain resources were strong, ultimately it was felt by the respective specialist that there were stronger socio-economic and political drivers at work than the bio-physical driver of flow changes, that had in the past and would in the future be the more significant influence on local communities' choices and outcome. Hydrological flow, was just seen as one of several "flows" occurring in and around the communities studied, with the flow of people (migration) being a primary one to consider. Another general issue that emerged during this exercise for the socio-economist was the observation that there were differences between what he understood to be potential positive and negative impacts arising from the Scenarios and what villagers' understood. Thus, there was a tendency for confusion as to whether he should be presenting the villagers' as local stakeholders reported views and opinions, or his own interpretation of future changes.

Overall, the Scenarios Workshop was not as decisive as some may have anticipated in coming to firm conclusions about future environmental and social outcomes brought about by flow changes, which as discussed may have been a result of unrealistic expectations placed on it and the emphasis placed by the E-Flows Team Leader on quantitative data, before there was sufficient understanding of the methodology and expectations of the exercise. While this was unfortunate, it did not imply that the exercise was not useful for raising capacity and exposing the entire team to a new way of looking at the complexity of "Flows".

Section 6: Multi-Stakeholder Meeting

Introduction

The E-flows approach applied in Thailand was developed based on the notion that E-Flows does not only consider the importance of river flows from a physical or ecological perspective, but also encompasses socio-political factors. The role that people play both as beneficiaries of the wider riverine ecosystem and at the same time, modifiers of the ecosystem are key to understanding E-Flows. The process of the E-flows assessment indicated that the stakeholders linked to the Nam Songkhram Basin are manifold including, people living along the river and their extended families working as migrants in other parts of the country.

The different stakeholders represent different geopolitical conceptualisations of the Basin. The participants represented different positions in relation to water allocation or restrictions (in terms of flood prevention). Thus, the appropriate environmental flow for the Songkhram river depends on the values for which the river system is to be managed. Those values will determine the decisions about how to balance environmental, economic and social aspirations and the uses of the river's waters.

The key component of the E-flow approach is to facilitate a negotiation between the different stakeholders on the reasonable and equitable utilisation of water in the Songkhram Basin. The multistakeholder meeting was a first attempt to initiate a dialogue between civil society, government officials and disciplinary specialists and community members on the roles and functions of the Nam Songkhram River by critically reviewing the outcomes of the technical assessments in the E-flows project.

This was in acknowledgement of the fact that although the Songkhram Basin spans four provinces, it is not at present managed as one complete unit, but rather split into six sub-basins with little coordination between these sub-units. Thus there remains a lack of a basin overview amongst key stakeholders about the nature and challenges of the Nam Songkhram Basin.

The interdisciplinary Environmental Flows work in the Songkhram River Basin was a first step in providing data and practical tools for river basin and water managers at national and local levels to apply similar approaches for better outcomes (see Annex 5 Multistakeholder Meeting).

Objectives of the Multi-stakeholder Meeting

1. To explore the implications of the findings of the environmental flows assessments in relation to possible development scenarios and other key research conducted on ecosystem and livelihoods in the Songkhram River Basin;
2. To discuss ways of utilizing the knowledge gained during the study to ensure sustainable resources management for the Songkhram River Basin and exchanging stakeholder perspectives;
3. To explore options for advancing and building-upon the E-Flows work as a legitimate multi-stakeholder approach to basin management, both within the Nam Songkhram Basin and others in Thailand.

The key findings from the Pilot Environmental Flows Assessment (see Sec 4) were presented in the context of the political discourse viewing the Nam Songkhram Basin as a flood affected area, and often portrayed as a "natural disaster". The findings of the pilot E-Flows assessment cast a different perspective about the functions and value of floods to the ecosystem.

Beyond E-flows: Development suggestions for the Nam Songkhram River Basin

Environmental flows, especially given the frequently voiced suggestions for improved "conservation," could form an important component of the environmental education and awareness-raising perceived as necessary for integrated management of the Nam Songkhram river basin. Table 2 provides development suggestions from the workshop that, although going well beyond environmental flows, constitutes the larger Nam Songkhram Basin context in which future environmental flows work must be situated.

Table 2 Compilation of suggestions for realistic and appropriate development in the Nam Songkhram River Basin

Aspect	**Development issues**
1. Occupations and quality of life	• Network of organic farmers • Support dry season cultivation • Build food security • Improve animal husbandry • Study customary livelihoods and culture in the Songkhram Basin and link to alternative occupations • Networks to support eco-tourism
2. Improving land use planning and land tenure	• Systematic land use zoning • Improve urban planning with community and local administrative organization participation • Land title reform for clear ownership rights
3.Conservation and natural resource use	• Conserve fish pools and areas of high biodiversity • Energy security • Build model villages for natural resources management following the self-sufficiency economy approach • Grow local rice varieties; restore seasonally flooded forest tree species • Build conservation awareness in people • Conserve headwaters, middle reaches, and lower reaches • Create zones for forest and public land • Develop environmental studies curriculum for in-school and continuing education • Provide knowledge in soil conservation and soil quality improvement
4. Water system management	Apply environmental flows studies to more areas • Develop small system irrigation methods, with participatory community management • Coordinate international cooperation; link Mekong work with Nam Songkhram Basin work • Stress the “people and water” coexistence approach as promoted by H.M. Queen Sirikit • Improve systems for flood watch/preparedness & flood damage compensation system
5. Fisheries development	• Improve standards for aquatic animal food processing • Avoid using large scale fishing gear considered destructive (e.g. *kad* (barrier net), *ouan lun, ouan lak* (beach seine) • Real efforts at law enforcement • Control caged fish culture and ensure appropriate production and market planning
6. Pollution prevention and control	• Proper management of garbage • Treatment of polluted water at source • Campaign to reduce chemicals • Conservation volunteers to survey water quality
7. Administration	• Establish provincial level working group with realistic role

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Aspect	Development issues
and management	and functions, as well as local level working groups to support • Determine a basin development master plan • Transform it into provincial action plans • Coordinate data and information technology • Provide data on state policy and for large projects; allow community to participate in impact assessment • Let the local administrative organizations serve as integrators of relevant plans and implement them together with communities • Let people learn about E-Flows through many channels • Coordinated planning and integrated budgeting between central and local government + communities • Community learns about relevant legal instruments and advocates for local government statutes • Build private sector participation to support implementation plan and to participate in working group/s • Raise awareness for administrators / civil servants at all levels • Exercise joint oversight over basin development budgets

Conclusions of the Meeting

The multi-stakeholder meeting was an important opportunity to present findings of the environmental flows assessment study. Many of the study's key findings appear to have been recognized and acknowledged by the participants. The workshop provided important critical feedback to the study team in terms of designing further environmental flows studies in the Nam Songkhram Basin.

The meeting also showed how a range of Nam Songkhram Basin stakeholders already perceive the implications of future development scenarios. Although there was no consensus on how desirable it is to intensify dry season cultivation, there was important consensus about the *ad hoc* nature of agriculture and land use change in the Basin, and the resulting ecological degradation.

The continued integrity of the floodplain ecosystem is in doubt. It is clear from participants' discussion that not only is integrated water resources management needed, but also land use zoning with a review of land tenure policies is urgently required.
In terms of steps forward, it will be important to monitor the establishment of any new Basin level management organizations and to continue working as closely as possible with key actors in support of broadly defined environmental flows approaches.

Additional key outcomes:

1. The agreement to establish of an inter-provincial joint committee for the Songkhram River basin was spearheaded by the e-flows work.
2. A new methodology for E-flows was developed in Thailand to fit the local context in the Songkhram
3. Pioneered interdisciplinary work for River Basin management in Thailand
4. Songkhram River proposed as a potential RAMSAR site by the Thai government.

5. Showcasing the importance of recognizing local people's knowledge in Songkhram River Basin management

Section 7: Conclusions and Recommendations

The Nam Songkhram Basin E-Flows study was a preliminary and innovative attempt at integrating aspects of an Environmental Flows approach into a systematic process to better understand the relationships between hydrological flows, floodplain ecology and societal dependency on the floodplain and its services. The study emerged from a growing concern amongst many observers that river basins in Thailand are being rather poorly managed and the core ecosystem services and functions they provide are gradually being degraded and diminished.

A vision was set out to trial E-Flows in the Nam Songkhram Basin at the 2nd Southeast Asia Water Forum in 2005 by two local stakeholders, when they made a presentation to gathered delegates on the theme: "Environmental Flows – Ecosystem and Livelihoods – the Impossible Dream?" Rattaphon Pitakethepsombut, the MWBP Demonstration Site Co-Manager and Sansonthi Boonyothayan, the chief of Nakhon Phanom Provincial Agriculture and Cooperatives Office, made a case that because of ongoing participatory action research being undertaken by local people (Tai Baan Research) and a desire by provincial government offices to develop more sustainable agriculture, the time was right for an E-Flows initiative in the Nam Songkhram Basin that might build on knowledge accumulated and networks already established between state and non-state actors (IUCN, 2005).

At the same time there was a general consensus of opinion amongst some key actors in the water management and conservation field regionally, that there was a good opportunity to build on the work being conducted and partner networks being established by MWBP in the Thai Demonstration Site by trialing an E-Flows approach in the Nam Songkhram Basin. These institutions included the WANI of IUCN, IWMI and the MRC's Water Utilization Program and Environment Program, which was involved in its own Integrated Basin Flow Management (IBFM) study between 2004-08 and regarded an E-Flows study on the Nam Songkhram as being complimentary.

The decision to actually conduct an E-Flows study process was assisted by a positive local response from a series of consultation workshops and meetings held during late 2005 and early 2006, which explained some of the main principles of E-Flows to interested Basin stakeholders and garnered opinion. In view of Thai government policy to implement Integrated Water Resource Management (IWRM) principles in national water resources management and moves to establish Riverbasin Organisations (RBOs) in 25 river basins nationwide, the opportunity to trial an E-Flows approach in the Nam Songkhram Basin was seen as a valuable one and supported by all key Basin stakeholders consulted including the Thai National Mekong Committee (TNMC), the Department of Water Resources (DWR), the National Environmental Policy and Planning Office (ONEP), the provincial Natural Resources and Environment offices, the Department of Fisheries and key academics from the main regional university campuses.

Subsequently a multi-disciplinary study team was assembled to conduct rapid field assessments of the river basin at the two seasonal extremes of flow. The methodology adopted was a variation on an Intermediate Environmental Flows Assessment approach, with a strong socio-economic focus and particular attention being placed on the role of seasonally-flooded forest to livelihoods. Having exchanged observations both in and out of the field, they were later required to consolidate their findings, and provide feedback, to interested external parties at various workshops, as a means to widen the understanding of E-Flows approaches and their implications to river basin management.

While the approach adopted was based mostly upon the hydrological profile of the three selected sites, it required team members to adopt cross-disciplinary thinking with active exchange of knowledge and field technique taking place between specialists, which contributed to a capacity building objective of the study. Although the study was conducted in a bi-lingual atmosphere, the team were introduced to many unfamiliar English language concepts and terms related to E-Flows, which was understandably confusing at times for some team members,. Of benefit to all team members was a greater understanding of the key importance and sub-components of the annual hydrological cycle or “flood pulse” that underpins ecological diversity and productivity. These key events in the cycle were isolated and analysed at the Scenario Workshop and studied in relation to each discipline for their ecological and social significance. For example, the timing, duration and height of floods were analysed in depth, while new terms such as dry season low flows, “freshes”, small in-channel floods, inter-annual flood events entered the vocabulary of the team for the first time and related to individual disciplines. Although no final quantitative conclusions about flow requirements were forthcoming from the Scenario Workshop exercise, as this would require further study and inter-disciplinary exchange, it could be considered a success from an awareness raising and capacity building perspective, and team members left with a new appreciation of the role and function of flows for regulating ecosystems.

This above observation relates to a general conclusion that can be drawn from the Songkhram E-Flows study in general, namely that for a first exercise such as this, it may be unrealistic to gather too much quantitative data beyond the hard data provided by hydrological field assessments and some relatively crude fishery or botanical numerical data. Certainly for the landuse / agriculture and socio-economic specialist, it was only possible to collect limited quantitative data. This reflected not only time constraints at any one site, but also the nature of the disciplines themselves which tend towards a more holistic and contextual approach, where qualitative and contextual field observations make far more sense than reductionist or positivist approaches to data collection. This quantitative / qualitative question was actually a source of some contention and confusion within the team about best approaches to fieldwork, with the E-Flows specialist tending to align with the quantitative school of thought, while other team members had trouble adjusting to this style of work. In the end, a compromise approach was found and there was learning on all sides of the debate, but it is an issue that should be considered carefully in any other E-Flows study of this nature. A later analysis of the Songkhram E-Flows approach by one of the Team members concluded that it displayed concurrent elements of a scientific concept and a stakeholder dialogue approach, which could be construed as a strength or weakness, depending on one’s predominant worldview and expectations (SLU, 2007).

A general conclusion that can be drawn from the Nam Songkhram E-Flows study is that preliminary studies should be strongly process-oriented, rather than results-oriented and close attention should be paid to the contextual (and contested) nature of “facts” as often uncritically presented in other study reports the team viewed. Such data should often be treated with caution, until a consensus agreement has been reached. To raise a basic example, is the disagreement over something as simple as the length of the Nam Songkhram River itself, which can be found in various reports quoted as anywhere between 420 kms and 495 kms long. Even the “hard sciences”, such as hydrology and aquatic ecology, were often found to be lacking and controversial in the data they presented, especially that drawn from earlier studies which were presented as being unassailable “facts”, by their author/s, but on close examination were found to be based on flimsy assumptions or extrapolation from other sites. This might be related to the apparent absence of modern flow monitoring equipment at the key mid-basin flow monitoring station at Ban Tha Kok Daeng, on which much hydrological data for the Nam Songkhram Basin is based. Another example, would be the apparent absence of empirical hydrological, ecological or social data for a major new dam project built at Ban Nong Gaa by the Department of Water Resources (key basin water managers, planners and decision-makers over water allocation and policy), despite its obvious impact on flows and ecology, raising many questions about the basis for and legitimacy with which water infrastructure projects in Thailand are planned, designed, built, operated and (in the case of Ban Nong Gaa dam), rapidly abandoned by the state by transferring responsibility to local people who were unprepared or unwilling to take on such an onerous role.

A main objective of this study was to “understand ecosystem roles in people’s livelihoods, especially seasonally flooded forests, by establishing the present day relationships between flow regime, ecology and human-level dependencies”. Indeed, the E-Flows team spent much time focusing on the role and importance of the *paa boong paa thaam* to local livelihoods and saw the multiple links with flow regimes, ecology and local socio-economics, but were cognizant of the rapid decline in both quantity and quality of the remaining forest resources. Indeed the team witnessed first-hand the on-going conversion of the seasonally flooded forests from common pool, multi-benefit property regime to privatized agricultural land (rice and eucalyptus mostly) in the period between the wet and dry season visits. The socio-economist, reflecting the views of some villagers met, has speculated in his report that the seasonally flooded forest on the Nam Songkhram Basin may be destined to almost total destruction and predicts “ecological regime collapse”, given the power of external forces that have no vested interest in conserving natural resources and pursue short-term financial accumulation goals. This view reflects the wider institutional failure of the state to adequately recognize and protect important wetlands, beyond mere rhetoric in distant Bangkok from isolated government departments, while unhelpful policies and perverse economic subsidies to dominant stakeholders to destroy ecosystems remain in place.

In Thailand, little distinction has been made in the past between natural, cyclical and benign flooding and unpredictable, often semi-manmade and destructive flood events, with nearly all flooding being portrayed in terms of “natural disasters” by the state and mainstream media, no matter what the underlying nature or cause of the floods may be. The present report shows that measures implemented by state agencies to control floods in the Songkhram Basin appear not to have any mitigating effect on flood occurrences in the downstream floodplain, but in many cases actually aggravate local flooding. By modifying the flows and floods, the entire floodplain ecosystem maybe threatened with disintegration and simplification. The E-Flows study helped highlight the importance of the annual flood event to key basin stakeholders at the Dialogue Workshop held in May 2007, most of whom would have been more familiar with hearing about floods as a “natural disaster”. Although, the following quote may slightly exaggerate the degree to which the E-Flows study has altered public perceptions, it does indicate that there was useful engagement with key stakeholders to address some of the basic misconceptions surrounding floods and flooding.

“The E-flows project has succeeded in convincing the public sector to realize that flooding is “profit” rather than “problem”. Now the word “disaster” is out-of-fashion in the Songkhram River Basin. To ensure sustainable development of the Basin we are now working on establishing a joint committee and management plan for the Basin”.

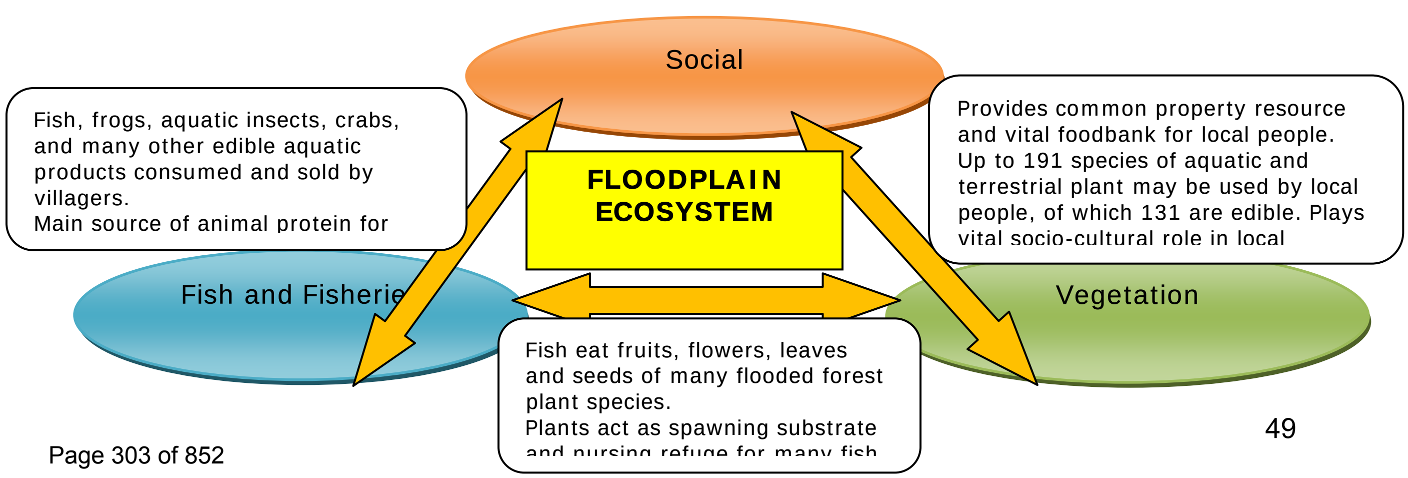
Khun Sansonthi Boonyothayan, Chief of Provincial Agriculture and Cooperatives Office, Nakhon Phanom

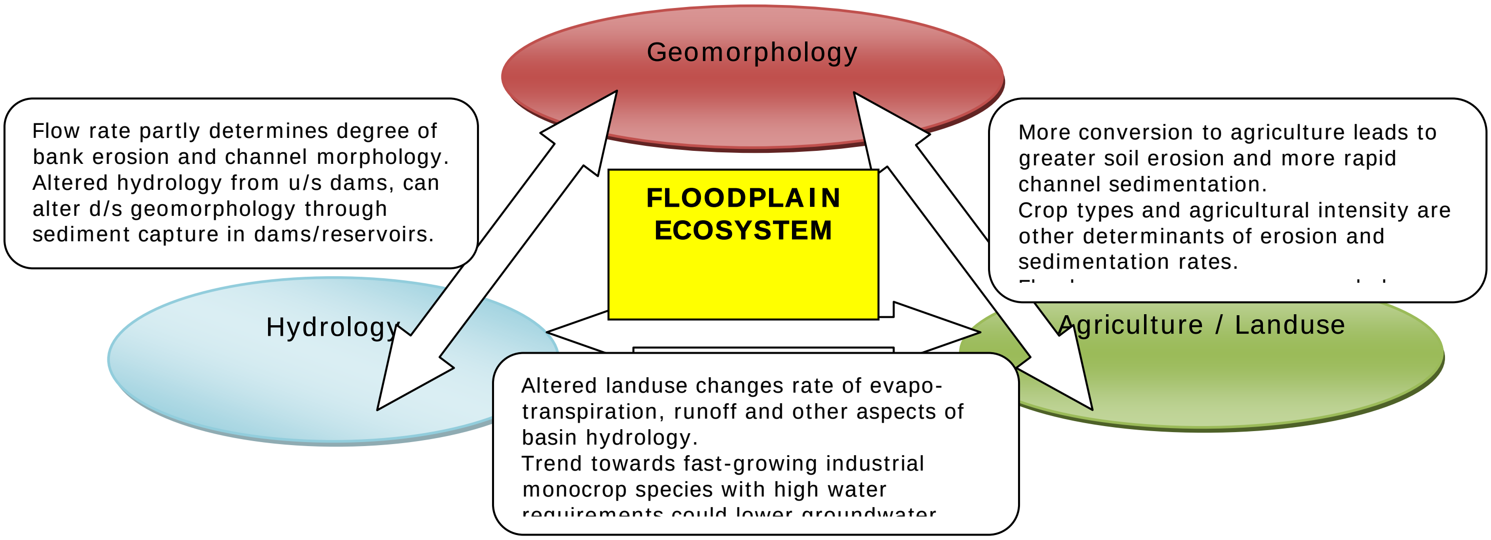
The work of the Nam Songkhram Basin E-Flows study attempted to continually stress the inter-disciplinary linkages at the core of the process and underpinned the effort. It helped cement and broaden understanding amongst the team members and allowed them to more confidently talk about issues outside their core discipline when communicating with interested observers, according to the team members' feedback. Simply put, they began to see the wider linkages between flow, ecosystem and livelihoods towards the end of the process, which were not immediately apparent from the start. An increased knowledge and appreciation of the river floodplain system and how hydrological flows affect it, is a key output of the E-Flows process. An unexpected output was the realization that there are several other analagous "flows" occurring on and around the floodplain, beyond the watery flows, which consumed most of the team's attention. These include the flow of natural resources on and off the floodplain and the flow of people in and out of communities, which it was felt are equally deserving of further attention in a truly holistic study. Now a question remains of whether this learning amongst a small sub-section of basin stakeholders can be communicated to others across a wider cross-section of society and in particular reach more senior basin planners and decision-makers, who in the short-term will largely decide the fate of the river and its resources.

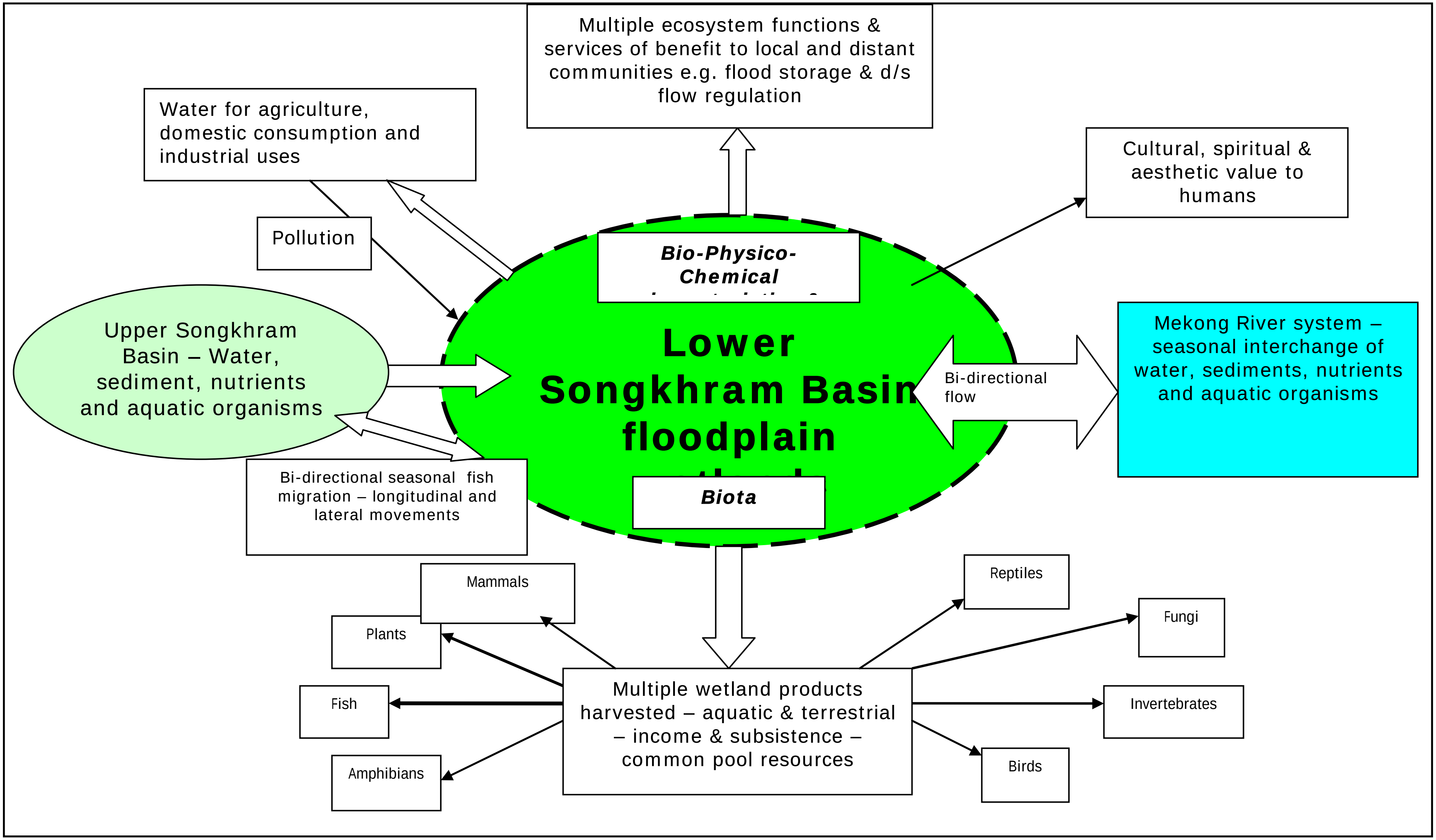
The Nam Songkhram River floodplains show the typical characteristics of a productive "flood pulse" river system, with natural seasonal flows and floods being the key drivers behind the rich productivity and biodiversity found there. The influence and inter-connectedness of the Mekong mainstream hydrology and ecology are additional factors that have ensured a highly productive fishery in the past. However, there are growing signs that the diversity and productivity are starting to rapidly decline and local stakeholders are reacting in different ways to the environmental changes they experience. Many blame population growth, over-fishing and use of destructive fishing gears as the principle causes, while far less attention has been paid to ecological changes brought about by flow and land use changes over time. Lamberts and Bonheur (2006) have pointed out the apparent dichotomy that while flood pulse river systems are very resilient to natural inter-annual variations in flooding, they are at the same time sensitive to changes in the flow regime brought about by anthropogenic disturbances to the flow regime. It is likely that ecological decline is precipitated by a number of local and external factors that may lead to negative impacts on local livelihoods and well-being.

Below are two simplified examples of some linkages identified between disciplines, that can be related to the Nam Songkhram floodplain ecosystem and are indicative of the benefits of an E-Flows approach to learning.

Conceptual diagram of Lower Songkhram River Basin wetlands relationships with Mekong and Upper Songkhram Basin




Geomorphology
Flow rate partly determines degree of bank erosion and channel morphology. Altered hydrology from u/s dams, can alter d/s geomorphology through sediment capture in dams/reservoirs.
More conversion to agriculture leads to greater soil erosion and more rapid channel sedimentation.
Crop types and agricultural intensity are other determinants of erosion and sedimentation rates.
FLOODPLAIN ECOSYSTEM
Hydrology
Agriculture / Landuse
Altered landuse changes rate of evapo-transpiration, runoff and other aspects of basin hydrology.
Trend towards fast-growing industrial monocrop species with high water


Multiple ecosystem functions & services of benefit to local and distant communities e.g. flood storage & d/s flow regulation
Water for agriculture, domestic consumption and industrial uses
Cultural, spiritual & aesthetic value to humans
Pollution
Bio-Physico-Chemical
Upper Songkhram Basin – Water, sediment, nutrients and aquatic organisms
Lower Songkhram Basin floodplain
Bi-directional flow
Mekong River system – seasonal interchange of water, sediments, nutrients and aquatic organisms
Bi-directional seasonal fish migration – longitudinal and lateral movements
Biota
Mammals
Reptiles
Fungi
Plants
Fish
Amphibians
Multiple wetland products harvested – aquatic & terrestrial – income & subsistence – common pool resources
Invertebrates
Birds

While the Nam Songkhram Basin E-Flows study was clearly of apparent benefit to the people who directly participated in it at various levels of engagement, it should be stressed that this first exercise should be regarded as only the start of a process. It was not intended to provide clear, definitive answers about the way forward for diverse river basin stakeholders, such as minimum flow levels or precise instructions or blueprints for basin management. Rather it was designed more to provide a set of pointers for planners and decision-makers about new and innovative ways to engage in river basin planning from an inter-disciplinary and holistic perspective that recognizes multiple uses and the complexity of the environmental and social relationships within the basin. At the same time, it flagged up areas of immediate environmental concerns and potential future issues that were evient from the fieldwork. The challenge now for interested parties is how to build on this preliminary knowledge base and utilise it wisely in future development decisions in the Nam Songkhram Basin, while adapting or even replicating a similar approach in other river basins in Thailand and elsewhere in the Lower Mekong Basin countries. A provisional agreement by participants to establish an inter-provincial joint committee for the Nam Songkhram Basin was a positive outcome of the E-Flows Multi-stakeholder dialogue meeting in May 2007, but needs political will and effort to bring to fruition.

A single E-Flows study is not an end in itself, but a valuable means to an end or “stepping stone”, and this study in the Nam Songkhram Basin should be regarded as the first step to a much more complex and extended process of reversing a long decline in ecosystem health. Identifying and including all stakeholders in decision-making processes, promoting equity while negotiating “rights and responsibilities” for each stakeholder group, should be ongoing goals in ensuring river basin management includes consideration of environmental flows as a key component for the future in Thailand and elsewhere.

Recommendations

- The Nam Songkhram E-Flows approach and methodologies adopted was shown to be a practical way of integrating diverse disciplines and creating an understanding of linkages greater than the constituent sum of the parts. Thus, there is much to be said for other Mekong sub-basins adopting and adapting a similar approach to holistic river basin management, where understanding flow, ecosystems and livelihoods guide and inform the practitioners.
- It would appear that the Lower Songkhram River Basin’s wetlands ecosystem is still relatively healthy compared to other river basins in Northeast Thailand, indicated in part by the level of fish biodiversity recorded. This special status should be recognized by all stakeholders and concerted efforts should be put in place to conserve the habitats and hydrological conditions that permit this wide biodiversity. These include unimpeded access between the Mekong mainstream and LSRB floodplain, recognition and maintenance of the natural flood pulse and strict conservation of seasonally flooded forest habitat. It could also include consideration of removal of certain un- or under-utilised water infrastructure, including dams and weirs, and restoration of natural flow regimes. At the moment, remaining areas of seasonally flooded forest are still being cleared wholesale for expansion of rice fields and eucalyptus plantations. Tough measures are required to save the last remaining patches, which need to be jointly catalogued and closely monitored by community representatives and state-appointed officials from a variety of agencies.
- It is clear that there are serious challenges to sustainable water resources management in the Nam Songkhram Basin, some of which have been highlighted in the E-Flows study findings. An appropriate next step would be the establishment of a multi-stakeholder Nam Songkhram Basin Committee, (of the sort proposed at the May 2007 meeting), to review carefully the E-Flows process and results to produce a clear set of priorities for Nam Songkhram Basin

development, that recognized its multi-functionality and wide services it provides. The Scenario Workshop findings in particular highlight some of the risks and outcomes of following particular development pathways and could be used as a starting guideline.

- It is apparent at present that the state-appointed River Basin Organisations (RBO's), currently under the Department of Water Resources are not functioning independently, smoothly or efficiently, and do not fully represent the interests of the Nam Songkhram Basin as a single ecological unit or the diverse interests of the people that draw their livelihoods from the floodplain ecosystem. Thus there is a need to independently review the entire justification, structure and working practice of the six sub-basin committees presently established in the Nam Songkhram Basin and fundamentally reform them, if necessary creating a future single Nam Songkhram Basin Organisation within the DWR framework.
- A major issue highlighted by the field study, particularly in relation to landuse and social considerations was the rapid conversion of floodplain habitat to eucalyptus plantation, mostly being undertaken by smallholders in the belief that it would provide short-term economic benefits. Most of those interviewed had little understanding of the risks involved, either economically (e.g. price fluctuations) or ecologically (e.g. soil and water degradation) but were driven by profit and labour considerations.. A recommendation that should be implemented with some haste is for academic or other qualified research institutions to conduct in-depth studies on the socio-economic and ecological relationships and impacts of eucalyptus plantations in the Nam Songkhram wetlands, with a moratorium on further planting until the results are published, deferring to the Precautionary Principle.
- Where there is large water infrastructure constructed on the floodplain that obviously impact river flows e.g. Nong Gaa "Weir" (read: dam) structure in Ban Dung District, Udon Thani Province and some of the larger tributary dams and weirs, a detailed impact assessment is carried out for each project. These assessments, following the E-Flows inter-disciplinary model should look at upstream and downstream environmental and social impacts and evaluate the structure's contribution to the local economy set against estimated costs i.e. a comprehensive cost-benefit analysis. Where costs outweigh benefits, consideration should be given to dam decommissioning and flow and habitat restoration for future ecological benefits.
- It has to be recognized that the basic principles and methods advocated by E-Flows approaches are still not widely known or understood. Thus there should be a concerted public relations and education campaign about E-Flows in schools, universities, relevant government agencies, etc. with sufficient funding to allow a long and sustained process of integrating E-Flows principles into a wide subset of scalar levels from the community level up to the Basin level. This would require basic acceptance and support of E-Flows approaches with more than rhetoric at the national level, before any major progress could be made in this regard.
- Further research needs to be conducted on the relationship between the mainstream Mekong hydrology and that of the LSRB, with detailed modeling conducted on the effects of upstream developments in the Mekong Basin, both on the mainstream river and tributaries in Lao PDR. Of particular concern are the Yunnan dams (built and planned) and dams planned or under construction in Lao PDR. Of immediate concern are the hydrological changes from the Nam Theun-Kading Basin caused by Nam Theun 2 (completed in 2009), Theun-Hinboun (existing and planned expansion project) and Nam Theun 1 (under construction) hydropower projects which are expected to fundamentally alter the wet season flood extent of the Nam Songkhram Basin.
- The study's main findings and recommendations should be translated into Thai (and possibly other riparian languages of LMB) and the Thai version of the book "*Flow. The essentials of environmental flows*" widely disseminated to key basin stakeholders as a companion reader.

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Section 9: Annexes

List of annexes relevant to the paper and their website links.

Annex 1. Nam Songkhram River Basin

Annex 2 Activity timeline

Annex 3 Field Study Details related to Sec 4

Annex 4 Scenarios

Annex 5 Multistakeholder Meeting

PN67_2010_10
E-Flows in the Nam Songkhram River Basin
David JH Blake et al
Annex 1: Nam Songkhram River Basin

The description that follows here is a synthesis of available material, drawn from a number of sources, which gives an overview of the main points and characteristics related to the lowland floodplain parts of the basin.

Bio-physical characteristics

Climate

The Songkhram Basin's climate is dominated by the monsoon cycle, which includes a Southwest monsoon (humid-hot) from March to October and a Northeast monsoon (dry-cool) from November to February. The dry season stretches from early November to early April, while rains may fall from late April to late October. During the rainy season precipitation may be frequently heavy, with high temperatures and humidity and prolonged cloud cover. However, there are occasional periods of drought in the "rainy season" which may stress rain-fed crops in some years, if over 20 days. Annual rainfall varies remarkably between the drier south and west of the Basin (e.g. Waritchaphum District – 1,254 mm) and the wetter north and east of the Basin (e.g. Bung Kan District[1] – 2,943 mm). Early rainfall events in April and May are usually associated with heavy thunderstorms, which may be associated with strong winds that occasionally do structural damage to buildings and topple trees. Rainfall generally peaks in June or July, but occasional late tropical depressions or even typhoons from the South China Sea, may dump several hundred millimeters of rain on the basin in only a few days during the August to October period (see Fig 1.1). The provinces of Nong Khai, Nakhon Phanom and Sakhon Nakhon are in fact amongst the wettest in Northeast Thailand, with annual rainfall higher than that of most of Central and Northern Thailand and have previously been identified as the least prone provinces to meteorological drought, hydrological drought and physical drought (Mongkolsawat et al, 2000).

During the early part of the dry season from November to December humidity falls while evapo-transpiration rates rise. Minimum nighttime temperatures may fall as low as 10–12 ^{0}C in December or January, but rise to 30 – 32 ^{0}C in March to April period. Minimum daytime temperatures rarely fall below 22 ^{0}C at the coolest time of year with northerly winds, but frequently rise to 40 ^{0}C + at the peak of the hot season, before the southwest monsoon rains bring relief from the heat. The dry season very occasionally experiences some light rainfall events, not amounting to more than 5 – 10 % of the entire annual precipitation. Overall, relative humidity is higher in the Nam Songkhram Basin than in provinces lying to the south and west, averaging 85 – 88 % from June to September, thus favouring more semi-moist or dry evergreen forest types and specific vegetation associations not prevalent elsewhere in Northeast Thailand (Blake, 2006).

[1] While the District administrative centre of Bung Kan District, lies just outside the Songhkram Basin, much of the district lies within the northern fringe of the Basin and experiences very heavy rainfall for several months of the rainy season.

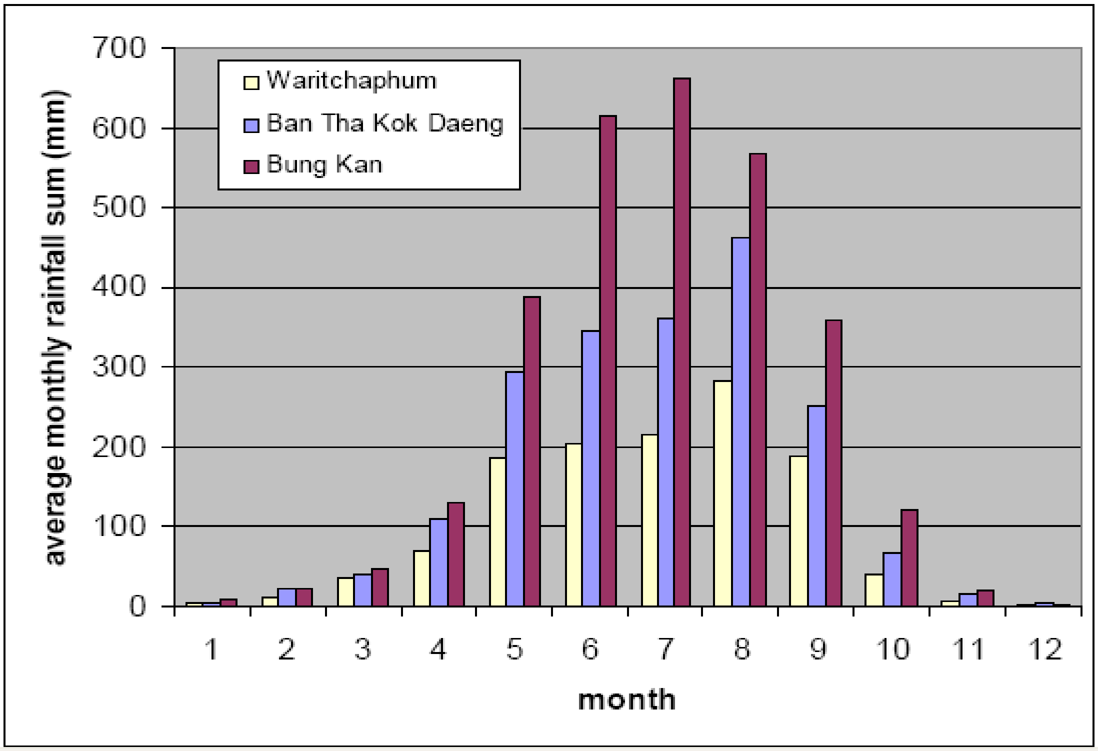

FIG 1.1: Average monthly precipitation at three stations in or near the Songkhram River Basin. Bung Khan District lies in the northern part of the basin, while Waritchaphum District is in the drier southern sector (Source: Sarkkula et al, 2005)

Geomorphic setting

The lowland landscape of the LSRB is comprised of a number of distinctive features, dominated by a broad floodplain, which starts to widen out some 250–300 km upstream from the Mekong confluence. The floodplain is characterized by a gentle gradient of approximately 1:30,000 and an elevation of 140–150 m amsl (above mean sea level). The river has formed large meanders, some of which over time have become oxbow lakes separated from the mainstream, and is bounded by river levees where village settlements are frequently located. Bordering the floodplain are low and middle terraces, often converted to paddy fields or other agricultural uses. Further away towards the hill ranges are high terraces, which may or may not be forested. The dominant land use of the basin is rain-fed paddy land, accounting for about 39% of the total area, with smaller areas of upland field crops and forested land, mostly degraded with the exception of the Phu Phan National Park and a few small fragmented areas, dominated by dry dipterocarp and some moist evergreen forest stands. There appears to be high soil erosion at many locations due to opening of forest lands and agricultural practices which do not encourage soil conservation, while lakes, rivers and streams appear to be suffering from accelerated sedimentation (based on anecdotal evidence of riverine pool progressive shallowing).

The geology of the Nam Songkhram Basin is composed of bedrock originating from the Mesozoic and Cenozoic eras. The LSRB forms part of a larger geological plateau formation known as the Sakhon Nakhon Basin, bounded by the hard sandstone capped Phu Phan hill range (up to 675 m high) to the south, and a series of low sandstone, shale and conglomerate hills (lower and middle Khorat series rocks) to the north and east, marking the watershed between the Nam Songkhram tributaries and the much shorter Mekong mainstream tributaries. Most of the floodplain and surrounding terraces are derived from the Maha Sarakham formation of the upper Khorat series, composed of a mixture of salt, shale and weathered sandstone. Formerly known as “the Salt Formation”, it contains considerable quantities of evaporates in the form of rock salt, halite, gypsum and potassium minerals, including potash (Mongkolsawat, 1988). The presence of salt bearing rocks and soils in the Nam Songkhram Basin, has a significant bearing on both its agricultural potential and the industrial exploitation of mineral resources, both at present and in the future, which may affect wetland productivity and biodiversity.

Hydrology and Flooding Regime

The annual rainfall pattern and local geography causes a highly seasonal hydrological cycle of flood and drought, which are a regular and dependable part of the LSRB’s natural environment. Water levels in the Songkhram River closely follow the annual precipitation pattern, with a rise in water levels occurring after the first heavy rains in late April or early May (see Fig1.2). Through May and June the river levels rise steadily and this period is known as the “*nam daeng*”, due to run-off from agricultural land, causing the river to take on a red-brown appearance due to the heavy suspended solid load. This period also coincides with the main upstream migration of fish out of the Mekong mainstream. In July, the river normally breaks its banks in several places, spreading water onto the floodplain and allowing many species of fish to spawn in the seasonally flooded forest. If rainfall continues the water will continue to rise, reaching a peak around late August or early September, after which the water will normally start to subside. There may be several lower sub-peaks before and after the main flood peak, and water will normally stay on the floodplain for 3–4 months, although there is much inter-annual variation. In a large and prolonged flood year, the water will not recede off the floodplain and into the Songkhram main river channel until mid to late October, although floodwater will remain in low-lying areas and pockets for much longer. The mainstream barely flows along most of its length from January to early April, with at least a hundredfold difference between average dry season flows and the peak flow months of August and September. The seasonally flooded forest does not totally dry out until about January, and even then there are numerous wetland lacustrine and palustrine features and habitats, where water remains in backswamps until the next rainy season.

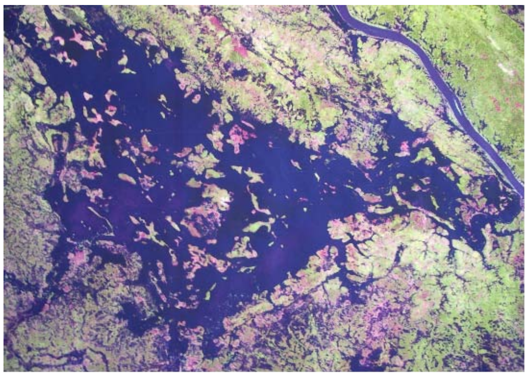

Fig. 1.2 Satellite images of the Lower Nam Songkhram Basin showing the extremes in surface water area between dry and wet seasons

*Box 1.1. The Seasonally Flooded Forest (*paa boong-paa thaam*)*

Paa boong paa thaam (PB-PT) is a type of seasonally flooded freshwater swamp forest ecosystem, unique to Northeast Thailand river floodplains and some Mekong tributary rivers of Lao PDR. Forest researchers and government agencies in Thailand have largely ignored it because of its perceived low value and few ecological studies have ever been published about this ecosystem. What information does exist is mostly limited to socio-cultural studies drawing on the rich body of local knowledge surrounding PB-PT, and published in Thai language (e.g. *Tai Baan Research* at Songkhram and some earlier studies from the Mun Basin). Officially it has long been classified as "vacant wasteland" or at best, "severely degraded forest". A local academic researcher has likened it to "*the womb of the river, the kidneys of the land*."

The vegetation of the PB-PT is tolerant to prolonged periods of flooding during the rainy season for periods ranging from two to five months. When not inundated it forms a complex mix of habitat and vegetation types, dominated by thorny mixed shrub and bamboo forest (*Bambusa* sp. is a highly successful pioneer grass species in the disturbed floodplain areas), interspersed with some larger remnant hardwood trees; damp, grassy hollows; permanent waterbodies; and more open, stunted vegetation areas. It mostly lies in a band of one to two kilometres width parallel with the main river channels, occupying the lower parts of the floodplain behind the levee, often within wide meanders. Whereas the levee is mostly composed of coarser sandy material, the PB-PT lies on soils made up of fine alluvial silts and clays, but generally has a low organic matter and is not as fertile as popularly believed.

Just four or five decades ago, anecdotal evidence indicates the PB-PT was still a healthy forest ecosystem with large trees and a wide array of wildlife present. Due to state granting of logging concessions to remove valuable timber trees, followed by extensive charcoal production in floodplain kilns, the forest was rapidly cleared. There followed in the 1980's and 90's a period of rampant land grabbing and conversion to agriculture, by both private commercial interests and local villagers, which still continues today. The PB-PT has thus been under intense external pressure for many years and is now much fragmented and degraded over most of its former range, with only small patches of near-original forest. Despite this decline, remaining pockets still contain a wide range of plant and aquatic animal biodiversity, which is utilised by local people for food, subsistence and income purposes. Of particular importance to villagers are the abundant fishery, bamboo shoots, mushrooms, edible vegetables and a vast array of medicinal herbs. These wetland products tend to proportionately benefit the poorer and vulnerable groups more, as they are mostly open access, common resources which require little investment to harvest and utilise. Fish however, are not always open-access resources and have been increasingly commercialised as a resource through use of larger fishing gears and auction of concessions.
(Source: Chusagun, 2001; Blake, 2006)
Box ends

Flooding in the LSRB is a function of not only within-basin precipitation, but also ambient river levels of the mainstream Mekong River, which profoundly influence the level of floodwaters and flow pattern of the lower Nam Songkhram River for several hundred kilometers upstream from the Mekong-Nam Songkhram confluence. The latter resembles in many ways, albeit on a much smaller scale, the well-known hydrodynamic phenomenon that occurs annually on the Tonle Sap Lake of Cambodia (Sverdrup-Jensen, 2002).

There is both a backwater effect (i.e. Mekong levels prevent Nam Songkhram river out-drainage and water backs up) and an occasional reverse flow effect at play, where Mekong water and sediments flow back on to the Nam Songkhram floodplain, which determine the height, duration and extent of flooding in the LSRB (Sarkkula et al, 2006). While the backwater effect is felt each year, the reverse flow phenomenon is less predictable and has been recorded only 10 out of 23 years, although some years it may happen twice or even three times according to an irrigation project impact mitigation study (Khon Kaen University, 1997). In 1978 the backflow lasted for four days (15-18 August) and an estimated 243.9 MCM of water flowed back upstream on to the Nam Songkhram floodplain (Khon Kaen University, 1997). The MRC/WUP-FIN project under the Mekong River Commission's Environment Programme has been undertaking hydrological modeling work in the Nam Songkhram Basin and have constructed a computer model showing the hydrological, hydrodynamic and water quality changes in the Nam Songkhram Basin during the course of a year (Sarkkula et al, 2005). This tool allows predictions and scenarios to be tested under simulated conditions.

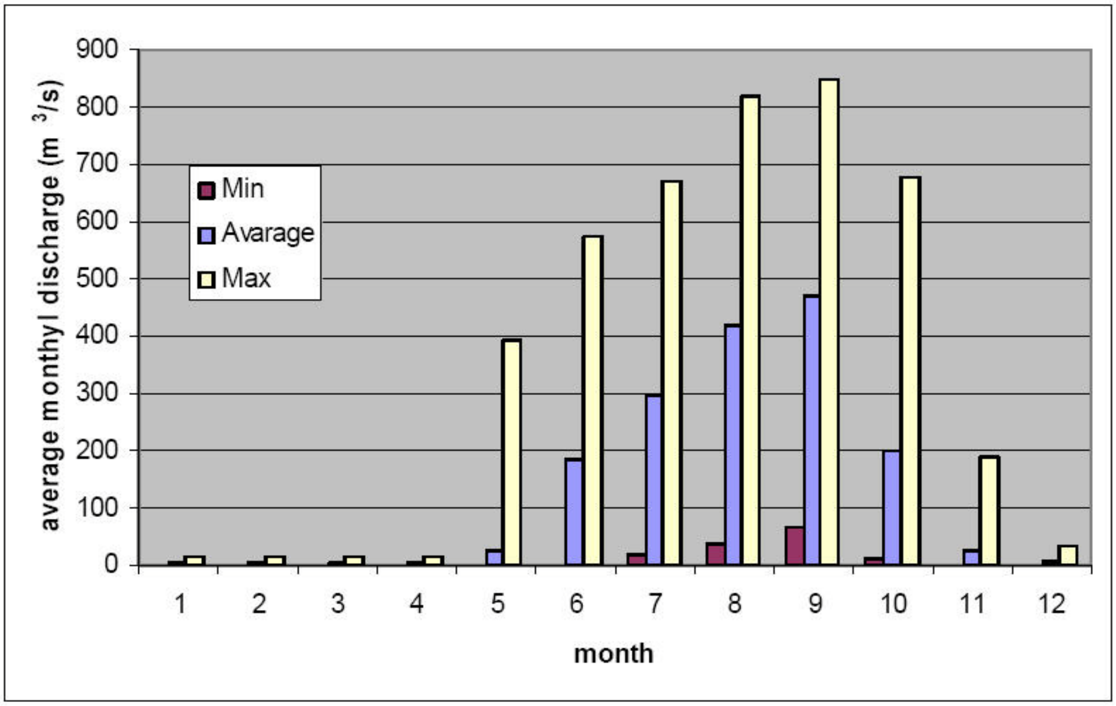

Fig. 1.2 Average monthly flows at Ban Tha Kok Daeng, Sega District, Nong Khai province, showing minimum, average and maximum discharges recorded. (Source: MRC/WUP=FIN, 2005)

Overview of wetland biodiversity

The LSRB is denoted as being a wetland ecosystem of wide habitat diversity and complexity, largely governed by the annual flood pulse, where water inundates the floodplain for three to five months each year following a long dry season and allows shifts in dominant biological communities from terrestrial to aquatic and back again according to season. The wetlands are perhaps best recognised for their impressive fish biodiversity, which has been relatively well studied compared to other taxa and recorded by fishery specialists over the last twenty years.

Key Biodiversity Values

Site description	The Lower Nam Songkhram River Basin encompasses a broad range of wetland habitat types associated with a functional floodplain ecosystem, linked to the Mekong River. Annual extensive flooding phenomena is dependent on in-basin precipitation and a backwater effect from the Mekong which in some years shows a marked backflow. The river supports a remarkably productive capture fishery, which peaks each year during the flood recession period, supporting the livelihoods of numerous families locally. The site is notable for holding one of the last extensive areas of seasonally-inundated riverine floodplain forests in the Mekong Basin.
Biodiversity highlights	The floodplain wetland site supports several rare and threatened fish species, including five species on the IUCN

	Red List; numerous semi-aquatic reptiles and amphibians; plus is an important resting and feeding site for migratory birds on the East Asian Flyway. The area is generally poorly studied for most major taxa and data is sparse.
Main Habitats	Seasonally inundated riverine forest, dominated by bamboo (*Bambusa* sp.) stands and mixed species low scrub (see Box 1.1) Marshes and swamps Ox-bow lakes and cut-off channels Mainstream river channel and pools Seasonal streams Artificial reservoirs and lakes Rice fields Seasonally flooded grasslands
Mammals	Data deficient. A live trapping survey a decade ago found eight species of mammals in five families, including the common tree shrew (*Tupaia glis*) and variable squirrel (*Callorciurius finlaysonii*) (Khon Kaen University, 1997). Presently, most species of mammals formerly present, with the exception of some bats, rats and other rodents, would appear to be very rare or absent in the lowland forest, probably due to hunting pressure and habitat loss. Anecdotal reports of Asiatic jackal (*Canis aureus*) by villagers.
Birds	Cumulative total of 102 species recorded to date, including 72 species in a rapid assessment for MWBP in March 2006. Some rare species found and the floodplains are thought to be an important staging post on the “East Asian Flyway” migratory route for birds.
Reptiles	Data deficient. One survey conducted for MWBP identified the presence of 40 species from direct observation and villager interviews. Most of the species are recognized to have wide ranges in the Indochinese subregion of mainland Southeast Asia. Two of them are endemics for the Lower Songkram River Basin Basin and adjacent waters, namely the snake species *Enhydris chanardi* and *Homalopsis nigriventralis.* Four species deserve the status of “vulnerable”, including the snail-eating turtle (*Malayemys subtrijuga*), the common softshell (*Amyda cartilagenia*), the Yellow monitor (*Varanus nebulosus*) and the water monitor (*Varanus salvator*).
Amphibians	Data deficient. One survey conducted for MWBP reported the presence of 16 species, most of which can be classified as common species in Thailand. A few species of narrow-mouthed frogs found (e.g. *Calluella* sp. and *Glyphoglossus* sp.) could be regarded as “near threatened” (NT) in their range.

Fish	At least 187 species have been identified during past Department of Fisheries surveys. These include the IUCN *Red Listed* 'critically endangered' giant Mekong catfish (*Panagasianodon gigas*), also recognized as a MWBP 'flagship species' and the world's second smallest fish species (*Boraras micros*) found in still waters. Local participatory research in the Lower River Basin recognized 124 species, of which 57 species were considered to be migrants from the Mekong mainstream and nine exotic species were present.
Invertebrates	Data deficient. Research for MWBP recorded 19 species of *Odonata* from 10 sites in March 2006. Local people report the presence of 10 species of mollusc, three species of shrimp and four species of crab from the LSRB wetlands complex.
Plants	No systematic and comprehensive biodiversity studies on plants appeared to have been undertaken in the LSRB, with the exception of Beung Khong Long. However, Sombutputorn (1998) reported the occurrence of 138 plant species associated with wetlands, including agricultural crop species and non-native introduced species. Local participatory research has identified a total of 191 native species of plants with beneficial uses found in the seasonally inundated forest of just four floodplain communities. A rapid survey for MWBP in March 2006, found at least 111 species of plants across nine wetland sites.
Fungi	In-depth participatory research by villagers in four LSRB villages over a year, revealed that 17 species of fungi are harvested from the *paa boong paa thaam* for consumption or sale (Tai Baan Research Network of Lower Nam Songkhram River Basin, 2005).

Geo-political context

The Nam Songkhram Basin has a long history of human presence, with rich archaeological evidence of Bronze Age settlements at Ban Chiang in Udon Thani province close to the river's upper reaches. The area, until relatively recently covered in dense forest and scattered villages, would have been hard to access and fully subdue by central authorities for many centuries, although taxes were collected on an *ad hoc* basis by Lao and Siamese vassal states in the 19th century. Local communities must have relied heavily on natural resources for subsistence and would have been mostly outside the mainstream cash economy of Siam (later to become Thailand) until the middle of the twentieth century. What trade was carried out was mostly for barter or exchange. This occurred within the Nam Songkhram Basin, such as the barter of processed fish products from villages next to the mainstream river with villages further upstream that had rice surpluses or produced salt by rudimentary methods, essential in the preservation of fish. The changes from a predominantly barter to a predominantly cash economy can be roughly traced by a brief consideration of changes in vegetation cover and land use that have occurred over the last half century or so. A detailed account of pre-modern village socio-economy and culture in Northeast Thailand and other regions can be found in Nartsupha (1984).

Historical description of vegetation cover in Lower Nam Songkhram River Basin

At the end of the Second World War it is likely that much of the riparian wetland forest and wetland habitats of the LSRB were largely intact and little disturbed by gross anthropomorphic impacts. Villages were small and scattered along levees or on middle and upper terraces along the side of the floodplain. Population density was much lower than the present day and villagers livelihoods were mostly based on subsistence modes, relying on a system of bartering surpluses of fish and other aquatic products for rice and salt, due to the inherent risks in rice production along the floodplain. As a result, there was little need to clear the seasonally flooded forest, as it provided plentiful food, fuel, medicine and building material in a largely non-monetised economy. From elderly villagers' anecdotal descriptions the floodplain forest was dense, tall in places and continuous with abundant game and wildlife including large ungulates, primates, large cats, elephants and crocodiles. The only exception to this vegetation community was the outer edges of the floodplain, which gave way to more stunted shrub forest and broad seasonally-flooded grasslands. On the terraces above the floodplain were dry or semi-moist evergreen forest, mixed deciduous forest and dry dipterocarp forests which also provided rich habitat for wildlife.
The decline and destruction of the Northeast's forests closely follows Thailand's development trajectory over the past five decades since the release of the first of nine five-year National Economic and Social Development Plans in 1961 (Bello et al, 1998). Blake and Pitakthepsombut (2006), borrowing from a Thai language report of a "*Seminar to Propose a Natural Resources Management and Environmental Plan by Lower Nam Songkhram Basin Communities*" propose three distinct periods in natural habitat conversion and associated natural resources decline:

- Era of trade in freshwater fish; logging concessions and commercial charcoal burning (1957 – 1977)
- Era of agricultural development and expansion of agribusiness (1977 – 1997)
- Era of industrial tree plantation expansion (1997 onwards)

These three eras suggest a step-wise process of systematic clearance of natural vegetation cover. First, companies were granted forest concessions to clear forests of large and valuable timber species for local use and export. This was followed by clearance of less valuable and secondary forest by local businessmen and villagers for charcoal production, using large kilns located in the flooded forest. As forests were denuded and road access improved, there was a steady inflow of migrants from other parts of Isaan, to take advantage of the relatively plentiful natural resources (especially fish) and land available, thereby increasing pressure on remaining forest areas.

In the late 1970s and 1980s there was a massive encroachment of former public lands (much of it degraded forest but classified as "vacant wasteland") by agribusiness companies with state connections and approval that converted the land they obtained to vast intensive cash crop "prairies" of up to 1,000 ha. Regular bulldozing of recovering vegetation and heavy use of chemical pesticides and herbicides ensured that these areas remain largely bare soil even years after cultivation has ceased (see Fig. 4 satellite image of the lower Nam Oon floodplain.). Some land belonging to agribusiness companies was used for fast-growing pulpwood plantations (e.g. Eucalyptus sp. and Acacia spp.) which displaced seasonally flooded forest.

As population levels increased in LSRB by natural growth and in-migration, and mechanization and intensification of agriculture adopted by villagers, pressure on remaining forests increased for both rice floodplain and upland terraces for cash crops and rice. The forest became progressively fragmented and degraded. This was followed by state policies such as “Assets to Capital”, funds to build irrigation schemes, compensation for crop loss due to flooding, and promotion of fast-growing trees such as rubber and eucalypts that increased forest erosion and loss while forcing villagers out of subsistence economy into cash economy.

Most land was claimed, bought and sold on the floodplain, even in the absence of land title documents, often by outside investors. Remnant patches of seasonally flooded forest, mostly occupying Agricultural Land Reform Office areas, faced the bulldozer. The final forest frontier of Northeast Thailand has been almost fully converted to agricultural land or monocrop plantations during the past decade.

Land reform and resource degradation

It has not only been private business interests that have gradually encroached on the *paa boong paa thaam* wetland habitats of the LSRB. The Agricultural Land Reform Office (ALRO), a state agency originally established in 1975 with the main purpose to redistribute large land holdings to the landless poor, has also been instrumental in land conversion and loss of commons. While ALRO has never successfully accomplished its mandate, it has frequently been implicated in large land scandals involving politicians and wealthy business interests (Bello et al, 1998). In the Lower Nam Songkhram River Basin, the Nakhon Phanom provincial ALRO has jurisdiction over at least 45,000 rai (7,200 ha) of floodplain land, originally designated as “degraded forest” or “vacant wasteland” (Blake and Pitakthepsombut, 2006), but actually comprised most of the land area formerly occupied by the biologically diverse *paa boong paa thaam*. Once land was declared ALRO administered, it was usually cleared of vegetation and allocated to eligible local families at the rate of 18 rai (approx. 3 ha) per household, with a land document issued that allowed the land to be inherited, but forbade the selling of the land plot or use as loan collateral. Following distribution to local households, other state agencies would often come in to the area and construct public infrastructure, such as roads, weirs and dams for irrigation. Hence, as the land was not considered by the state to have any intrinsic value as a forest or wetland, the main policy thrust was to convert it to agricultural land, principally for dry season rice cultivation. Ironically, within a few years much of the ALRO land allocated for irrigated rice cultivation had been abandoned, often due to withdrawal of state subsidies, the failure of the water delivery system and the regeneration of flooded forest vegetation. An early dominant colonizer, which seemed to thrive in the new conditions was the bamboo species (*Bambusa* sp.), and various edible and medicinal plants, popular with villagers.

From about 1980 onwards, as the nation concentrated on building up its status as a leading exporter of agricultural produce, including rice, cassava, sugar cane and jute sourced from the agricultural frontiers of Northeast Thailand, the rate of forest clearance increased. Between 1961 and 1985, the overall forest cover in Northeast Thailand reportedly declined from 42 % to 14 % and the remaining large forest pockets were mostly confined to upland National Parks (Vitayakorn, 1993). However, there is evidence to suggest that some of the most rapid clearance and wholesale conversion of the LSRB floodplain land came at a slightly later stage than other parts of upland *Isaan*, as indicated by the table below.

TABLE 1.1. Land Use Changes across 739 km^2 of floodplain land in the Lower Nam Songkhram River Basin between 1989 and 1998_(Source: Chutiratanaphan and Patanakanok, 2001)

Land Use Types	1989		1998		Land use changes (%)
	Area (km^2)	%	Area (Km^2)	%	
Urban land	10.27	1.39	16.11	2.18	+ 57.38
Paddy	348.12	47.12	353.81	47.89	+ 2.26
Field crop	59.03	7.99	67.38	9.12	+ 14.02
Forest	113.70	15.39	73.58	9.96	- 35.33
Disturbed forest	33.62	4.55	9.60	1.30	- 71.30
Bamboo forest	22.98	3.11	12.12	1.64	- 47.13
Disturbed bamboo forest	-	-	4.51	0.61	-
Idle land	105.94	14.34	138.89	18.80	+ 21.16
Marsh & swamp	21.65	2.93	13.30	1.80	- 38.69
Water Resources	23.49	3.18	49.50	6.70	+110.73
TOTAL	738.80	100.0	738.80	100.0	

Table 1.1 shows that land use categories of “forest”, “disturbed forest” and “bamboo forest” (this latter category is assumed to closely correlate with seasonally inundated forest) have declined by a total of 35 %, 71 % and 47 % respectively over a mere nine-year period. At the same time, marsh and swamp areas (i.e. natural wetlands) have declined by nearly 39 %. Looking at the other categories, maximum growth over the same time period was seen in “water resources” (i.e. artificial reservoirs), which increased by 111 % to almost 50 km^2, urban land went up by 57 %, followed by “idle land” increasing by 21 %. This latter category attests to the high rate of abandonment of agricultural land by both local villagers and agribusiness interests, following conversion from forest or wetland, which is still a predominant feature of the LSRB. Interestingly, while the sharp increase in water resources appears to be closely correlated with declines in forest and natural wetland resources, there has not been a corresponding increase in productive paddy land as a result of more irrigation sources available. Yet, the most common justification for construction of water storage reservoirs given by state agencies responsible (like the Royal Irrigation Department (RID) and the Accelerated Rural Development Office) has been provision of water for “agricultural use” in the dry season. The increase in “field crops” of 14 % is likely attributed to non-irrigated cash crops such as sugar cane and cassava grown on upper alluvial terraces and to a lesser extent, some irrigated high value crops (such as tomatoes and sweet corn).

Main threats to the Nam Songkhram Basin wetlands

It is recognised that the natural resources have changed greatly in the last few decades and a number of factors have been identified which pose threats to the health and integrity of the Nam Songkhram River Basin wetlands, and by implication, the livelihoods of the people that rely on them. Specifically, these include:

1. Large-scale water infrastructure developments built on the Nam Songkhram mainstream or larger tributaries which fundamentally alter hydrological patterns

2. Inappropriate and poorly planned infrastructure built on floodplains (incl. roads, embankments and flood protection measures) which may alter drainage patterns and connectivity to key habitats for fish and other aquatic organisms

3. Sensitive seasonally flooded forest degradation and conversion to agricultural land, often in response to central policies or local development schemes, which fail to take into account the value of the intact ecosystem.

4. Expansion of monocrop industrial tree plantations (e.g. eucalyptus and para rubber) which cause land degradation, nutrient export and may disturb the local underground water balance.

5. Expansion of salt, potash or other mineral extraction activities, which can cause negative impacts on soil and water resources.

6. The introduction and spread of invasive alien species (IAS), such as catclaw mimosa (*Mimosa pigra*), Nile tilapia (*Oreochromis nilotica*), and the golden apple snail (*Pomacea canaliculata)*.

7. In-basin population growth and urbanisation leading to increasing conflicts over water resources (quantity and quality), which are not being adequately addressed at present.

8. Changes in water flows, sediment and nutrient levels as a result of upstream changes in the Mekong mainstream affecting the annual flow patterns and floods in the lower Nam Songkhram Basin, due to their closely inter-connected hydrology.

Water Management and Institutional Analysis

Water resources planning, provision and management has traditionally been regarded as the responsibility of a large number of government agencies, unsurprisingly with much overlap, inter-departmental communications problems and questionable results. In 2002 there was a major departmental and ministerial rearrangement which saw the formation of a Ministry of Natural Resources and Environment (MoNRE). The Department of Water Resources (DWR) was formed below the MoNRE, with nationwide responsibility for water resources policy, planning, management and conservation, in line with Thailand's 1997 Constitution and National Water Policy of October 2000 (Blake and Pitakthepsombut, 2006). One of the goals of DWR was to apply Integrated Water Resources Management (IWRM), which was regarded as, "one of the perfect tools that should be applied in order to minimize the obnoxious problems." (www.dgr.go.th/tor/image.pdf/IWRMinTHAILAND.pdf).

This apparent panacea approach was to be extended to 25 river basins identified nationwide, including the three river basins covering the Northeast Region – the Mun Basin, the Chi Basin and a nebulous "Mekong Basin Area 2". This latter area was more a collection of sub-basins draining into the Mekong River in the Northeast between Loei Province in the northwest and Amnat Charoen Province in the southeast, including the Nam Songkhram Basin, as the largest individual river basin lying within the larger entity (Blake and Pitakthepsombut, 2006). Each of the 25 national river basin areas were required to form a River Basin Organisation (RBO) or Committee, which would in theory provide a structure of representation and participation from village level up through sub-district, district, provincial and national levels, to assist state goals of water management. Despite high expectations and large budgets dedicated to these RBO's, it is apparent from their first few years of operation that they have not fulfilled the mandate accorded them for complex reasons, often related to political interference and a reluctance of state agencies to break away from top-down governance patterns (Chantawong, 2006).

However, rather than treat the Nam Songkhram Basin as a single river basin, deserving unified and holistic treatment as one might expect under an IWRM approach, it was further sub-divided into six smaller "sub-basins", which on paper at least, seem rather arbitrary. They are listed below with surface areas given in parentheses:

- Huay Khong (71,288 ha)
- Huay Hee (74,819 ha)
- Nam Yam (174,023 ha)
- Lower Nam Songkhram River Basin (308,527 ha)
- Upper Nam Songkhram River Basin (328,573 ha)
- Nam Oon (356,570 ha)

For a detailed listing of formal and informal institutions concerned with water and wetlands management in Thailand, please refer to Table 13 of the Situation Analysis for the LSRB (Blake and Pitakthepsombut, 2006). To add further confusion and opportunity for overlap of duties and roles, agricultural water provision and management (the main interest of state agencies in the Nam Songkhram Basin) falls under the responsibility of two government departments, lying in different ministries that could be construed as being competitors for the same prize (Molle and Floch, 2007). In the Ministry of Agriculture and Cooperatives, the Royal Irrigation Department (RID) commands great influence and receives over 50 % of MoAC annual budgets, while in the MoNRE, the Department of Water Resources fulfills a broader remit than RID, but also participates in projects to provide water to farmers and rural voters. In a policy speech delivered in 2004, a former Minister of Natural Resources and Environment argued that having overlapping responsibilities by two ministries was "hindering" water resources management in Thailand and recommended they be brought under one ministry (MoNRE, 2004).

In addition to water for agriculture, other legitimate water uses recognized by the state are domestic use, industrial use and fishery use, with some recognition in recent years now extended to wetlands, although understanding of the definition of wetlands varies widely from agency to agency and individual to individual. However, these other water uses are considered insignificant in terms of their water requirements, both at present and in the future, compared to the supposed needs of agriculture, in particular the demand for dry season irrigation. Any problem analysis of the Nam Songkhram Basin by state institutions will always identify "flood and drought" as the two greatest obstacles to development that can be principally overcome invariably by infrastructural interventions, according to conventional wisdom (Blake, 2006). As a result vast resources are channeled towards fighting against the twin “evils” of flood and drought, even in river basins where these phenomena are no more than natural manifestations of the “flood pulse”. According to data obtained from a Dept. of Water Resources document showing plans for “Integrated Water Resources Management” by state investment for 2006-09 for the 25 Basins of Thailand, Basin 2 (Mekong) would receive 18,046 million baht, of which 13,510 million baht was budgeted to solve the “water shortage problem”, 2,128 million baht was budgeted to solve the “flooding problem” and the remainder was for management and pollution control issues.

Naturally, in addition to the state agencies involved in water management there are a number of non-state stakeholders, at various scalar levels, from non-formal village level institutions to a range of civil society groups and non-government organizations that are described in the LSRB Situation Analysis (Blake and Pitakthepsombut, 2006). This report also gives an analysis of the history, concepts and practice of decentralization, local decision-making, land access and ownership rights as they applied to wetlands management issues. In particular the roles and issues surrounding land reform and agribusiness spread are discussed in some detail.

Finally, no description of water management issues would be complete without a brief reference to the Nam Songkhram Project, a massive irrigation project conceived and promoted by the now-defunct Department of Energy Promotion and Development (DEDP), which was previously one of the major state actors in water resources development through the 1980’s and 90’s. Planned as an adjunct component of the even larger Khong-Chi-Mun megaproject or Water Grid variant (see Molle and Floch, 2007), the Nam Songkhram Project would have built a dam near the mouth of the Nam Songkhram River to create a large, shallow reservoir of about 255 km^2, drowning out the majority of the floodplain and inundating seven villages. Water from the reservoir would have been raised using electric pumps and irrigation canals to surrounding farmland (the planned irrigation area was 90,400 ha), where rice and cash crops would be grown. It took over a decade of feasibility studies, social and environmental impact assessments and mitigation plans, before the Nam Songkhram Project was finally shelved by the Thai cabinet as being too costly and having unacceptably high environmental impacts (Blake and Pitakthepsombut, 2006).

The project also attracted controversy due to spirited objections from local communities, NGO’s and some academics, who felt that there was insufficient public participation, local views were ignored and the official documents downplayed the likely impacts resulting from the project (Lohmann, 1998). Despite this apparent national level rejection, the Nam Songkhram Project is still very much alive in the minds of some state officials and politicians, and has been actively promoted by the RID in recent years. This promotion often comes to the fore during or just after natural floods, such as those that occurred in August 2005, when the then Prime Minster travelled to the area and announced that he personally would recommend the construction of the “Watergates” at the mouth of the Nam Songkhram to solve the problem of flooding, described as a “natural disaster” (Blake, 2006). However, as some commentators have noted, floods and flood “disaster” management in the Mekong region have a strong political element and whether benign or destructive, floods play an important role in the environment, livelihood and culture of the region (Manuta et al., 2006; Lebel and Sinh, 2007). In the Lower Nam Songkhram River Basin in particular, flooding is a natural phenomenon that occurs annually and is a defining characteristic of the local landscape and society, as well as being a prime source of both aquatic and terrestrial productivity.

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Annex 2: Activities timeline of the Songkhram E-Flows

Timeline of activities for Songkhram E-Flows 2005-2007

DATE	EVENT	LOCATION	PARTICIPATING STAKEHOLDERS
Late 2004 - Early 2005	MWBP partner dialogue about testing E-Flows approaches in the Mekong Basin, with Nam Songkhram identified as a suitable sub-basin	Various	IUCN, MRCS, MWBP staff, WUP-FIN/MRC, TNMC, IWMI
31 Aug 2005	“Environmental Flows – Ecosystems and Livelihoods – The Impossible Dream?” presentation to E-Flows audience at SE Asian Water Forum	Bali, Indonesia	IUCN-WANI, MWBP, IWMI
04 Nov 2005	Preliminary partner discussion & planning meeting, to prioritise Nam Songkhram E-Flows work	Chulalongkorn University, Bangkok	Chula Uni, IUCN-WANI, MWBP, WUP-FIN/MRC, IWMI, M-POWER, KKU
26 Jan 2006	Half day internal planning meeting	Udon Thani	IUCN & MWBP staff
10 Feb 2006	Songkhram E-Flows consultation and planning meeting for key stakeholders. Hydrological modeling session by WUP-FIN.	Udon Thani Fishery Station	MRCS (WUP-FIN, Fish Prog), TNMC, DoF, DWR, RID, KKU, IUCN-WANI, MWBP, TEI
10 Mar 2006	“Flow Fair” – poster presentations by E-Flows partners of existing projects in Songkhram Basin, consultation and priority planning for next steps	Udon Thani	MRCS (WUP-FIN, Fish Prog), TNMC, DoF, DWR, KKU, IUCN-WANI, MWBP, NPA&CO
09 May 2006	E-Flows orientation and planning meeting for key partners. Intro to E-Flows concepts & approaches by Rebecca Tharme (IWMI). Scoping options. Climate modeling by START-Chula Uni. Next steps presented.	Udon Thani	MRCS (WUP-FIN, Fish Prog), START-Chula, IWMI, IUCN-WANI, DWR, MWBP, NPA&CO

Annex 2: Activities timeline of the Songkhram E-Flows

DATE	EVENT	LOCATION	PARTICIPATING STAKEHOLDERS
Jun-Jul 2006	E-Flows team formation and production of “starter document” (key materials)		MWBP coordinating team
26 Aug – 03 Sep 2006	Wet season intermediate E-Flows assessment fieldwork	Songkhram Basin sites	E-Flows Team & observers
21 Nov 2006	E-Flows Team review of wet season findings, methodology review and planning meeting for dry season fieldwork	ONEP, Bangkok	E-Flows Team, MWBP, IUCN-WANI
Dec 2006	Distribution of wet season findings report internally		E-Flows Team and partners
1-9 Mar 2007	Dry season intermediate E-flows assessment fieldwork	Songkhram Basin sites	E-Flows Team and observers
26-27 Mar 2007	E-Flows summary presentation to MWBP Final Seminar.	Vientiane, Lao PDR	Key MWBP partners and invited stakeholders from across LMB
6-9 May 2007	E-Flows Scenarios Workshop	Udon Thani	E-Flows Team and observers
20-21 May 2007	Multi-stakeholder Dialogue meeting (MSP) for key actors (state and non-state) from 4 Provinces and central govt agencies to be briefed about E-Flows approach and main findings, and plan ways forward.	Udon Thani	E-Flows Team, participants from various organizations (state and non-state)
May-Jun 2007	Compilation of Songkhram E-Flows findings from wet and dry season field studies into one database and report preparation		IUCN-WANI & MWBP
Sep 2007	Rattaphon Pitakthepsombut attends and makes presentation at International River Symposium, on Nam Songkhram E-Flows project	Brisbane, Australia	R. Pitakthepsombut

Annex 2: Activities timeline of the Songkhram E-Flows

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Annex 3: Field Study Details related to Sec 4

3.1 Hydrology

Juha Sarkkula, Noora Veijalainen, Matti Kummu, Hannu Lauri, Jorma Koponen

This section is a summary extract from a report completed by the authors for the E-Flow Scenario Workshop in May 2007, Udon Thani. It should be noted that this work formed part of a wider MRC Water Utilization Program WUP-FIN2 project that involved hydrological modelling and socio-economic survey work in various parts of the Lower Mekong Basin, with cooperation between MRCS, the TNMC, Finnish Environment Institute, Helsinki University of Technology and several other state agencies for the work conducted in Thailand[1].

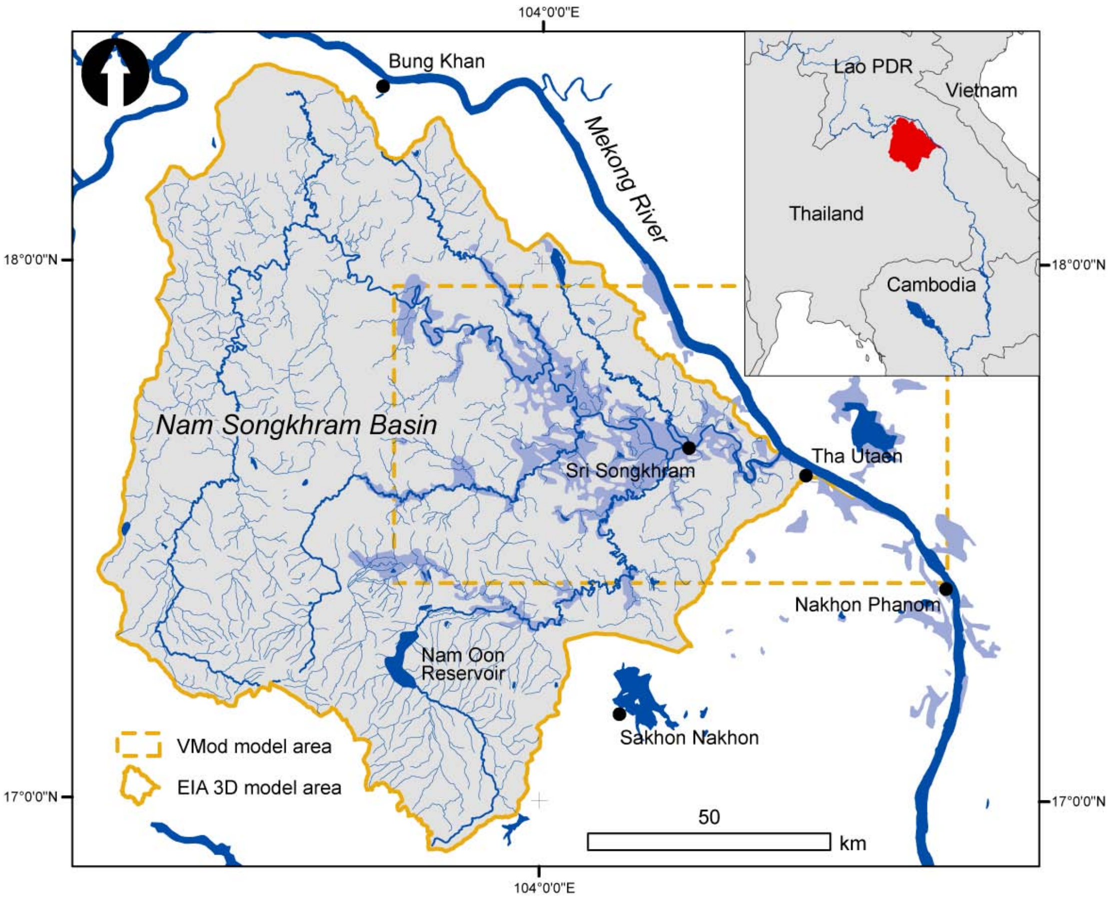


Figure 3.1.1. Model coverage areas in the Nam Songkhram watershed.

Methodology

[1] All WUP-FIN reports and other project information can be uploaded from the following website address: www.eia.fi/wup-fin

The main modelling tools used were the VMod and EIA 3D hydrodynamic model. The VMod, a distributed hydrological model application, covered the entire Nam Songkhram watershed. The EIA 3D model application covered the Lower Songkhram river basin floodplains and the confluence of the Songkhram River and the Mekong River (Fig 3.1). The VMod and EIA 3D models were developed by Environmental Impact Assessment Centre of Finland Ltd (EIA Ltd) The VMod model is a distributed physically based/conceptual hydrological model based on grid representation of the modelled catchment (MRC/WUP-FIN, 2006b). Hydrological processes in the catchment are simulated using simplified physically based formulations. The model can be used, for example, to simulate the impacts of climate change on the catchment hydrology. The EIA 3D model is a 3-dimensional hydrodynamic model that computes water level and water flow in the modelled area (MRC/WUP-FIN, 2006a). The model has been set up for the lower part of the Songkhram River Basin and its floodplain, for simulating water levels, currents, and inundation of the floodplain.

A time series (TS) of water level in the floodplain was earlier studied in five locations (Fig 3.2). The water levels, according to the simulations, were quite similar in each of the locations as can be seen in Fig 3.2 where the baseline simulation water levels in each point are presented during year 1980.

Present-day hydrological regime for each site

This section presents the hydrological regime for each of the three study sites (see Fig 3.3 for site locations). Because sites 2 and 3 are located on the floodplain, we can only present the complete hydrological analysis for site 1, which is situated on the Nam Songkhram mainstream. However, the following remarks can to be made for sites 2 and 3:

- Hydrological modelling was not possible, as these floodplain sites are inundated part of the year
- Mekong mainstream influence on these sites is extremely important during the flood season
- Local impacts are more important during the dry season

The flood extent during 17th of September 2000 and location of sites 2 and 3 are presented in Fig 3.3.

Site 1: Ban Cham Chi

The study site is situated on the main stream of the Nam Songkhram. Because there is no measurement station at this site, the hydrological results presented here are based on VMod hydrological simulation results. The variation of the monthly discharge is presented in Figure XX1. From the illustration, it can be noted that the maximum and minimum flows vary considerably from year to year.

Analysis of the hydraulic characteristics of each site

The channel profiles for each cross-section with dry and wet year discharge and water level illustrated are presented above in the previous section. The ADCP was used to calculate the discharges during the field trips, in wet and dry seasons.

The summary of the hydraulic measurements is presented in table below:

Site 1	Dry season: between 0 and 1 m^3/s
	Wet season: 133 m^3/s

Site 2	Dry season: 3.5 m^3/s
	Wet season: 482 m^3/s
Site 3	Dry season: 7 m^3/s
	Wet season: 85 m^3/s

Compare major hydraulic features across sites

Comparing Site 1 with Sites 2 and 3 shows great differences because the latter two are inundated for part of the year and become part of the floodplain. Site 1 also has a floodplain but it is not impacted by the Mekong back-water effect as are Sites 2 and 3. Thus the hydrological and hydraulic factors differ between these sites. Sites 2 and 3 are rather similar to each other during the wet season, but during the dry season the Nam Oon dam releases more water than the natural discharge would be. Thus, the discharge and flow velocities are unnatural along the Nam Oon and Site 3, consistent with the presence of a large irrigation dam upstream.

The hydrological characteristics for the average year are presented in Figure 3. ??

The modelled discharges for study sites 1 and 3 are presented in Figure 2. Site 2 is located in the floodplain, and thus it was not possible to model discharges for the wet season. The water levels for the site are presented in the previous section.

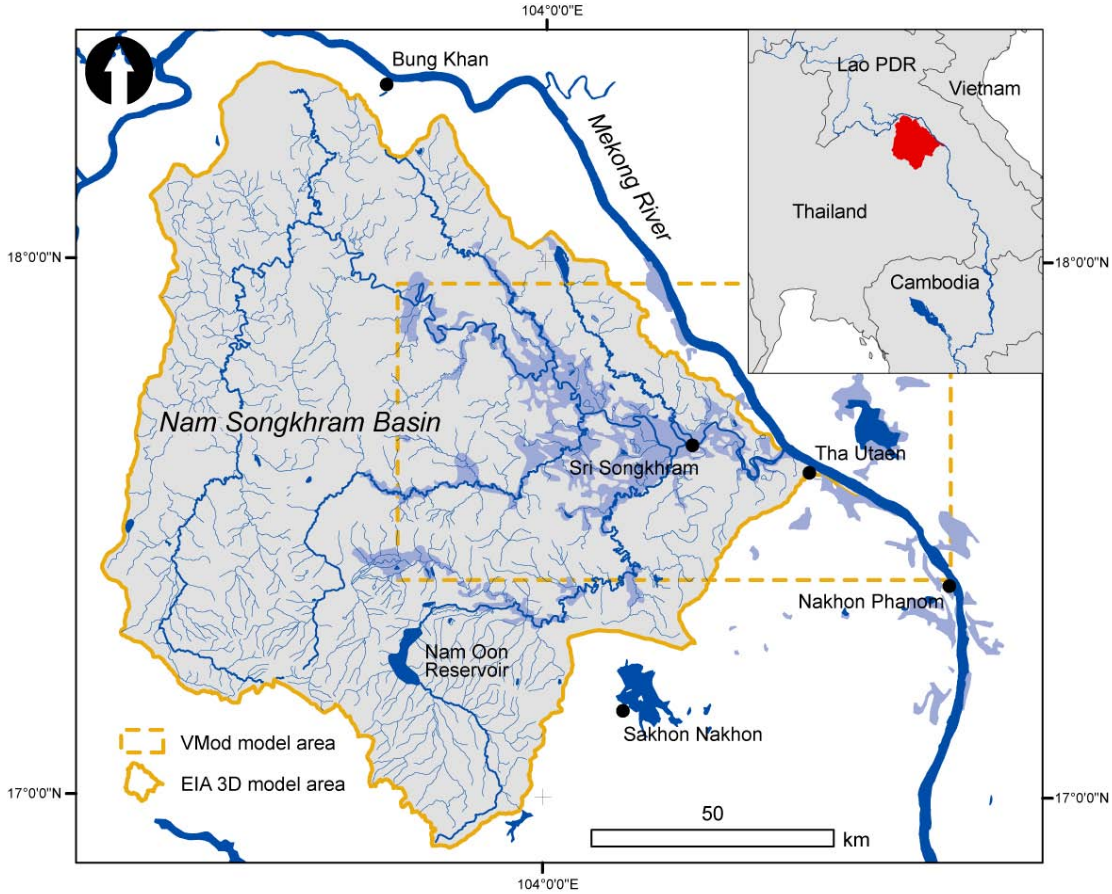


Figure 3.1.2. Model coverage areas in the Nam Songkhram watershed.

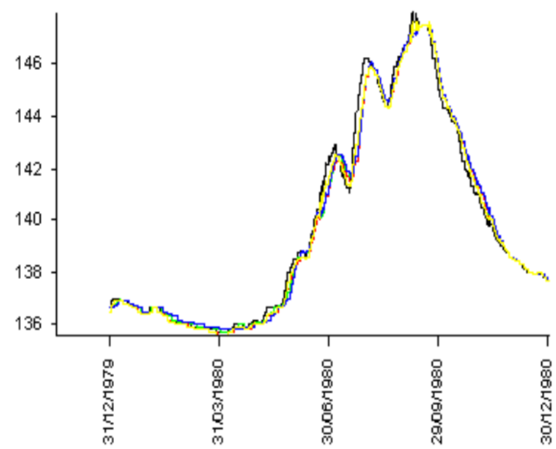


Figure 3.1.3. Water level in five locations in the floodplain during baseline simulation for year 1980.

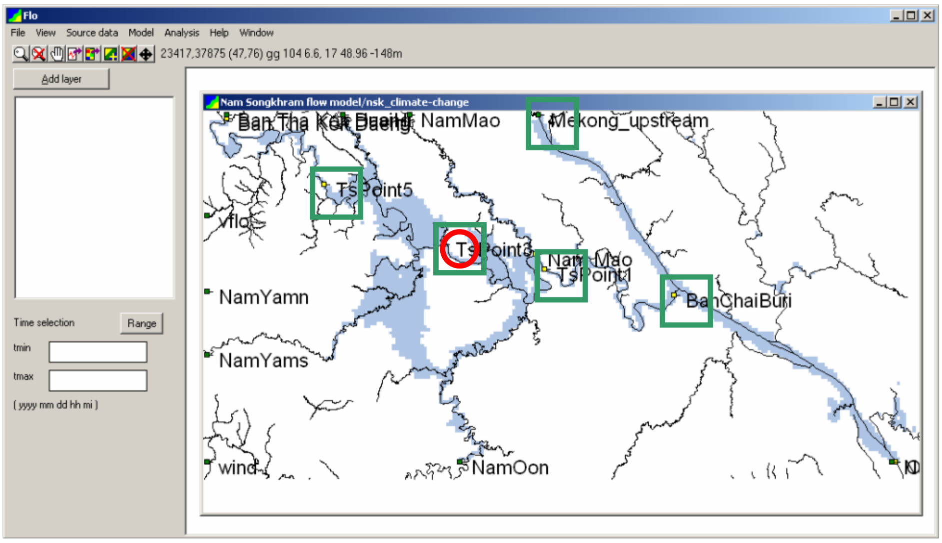
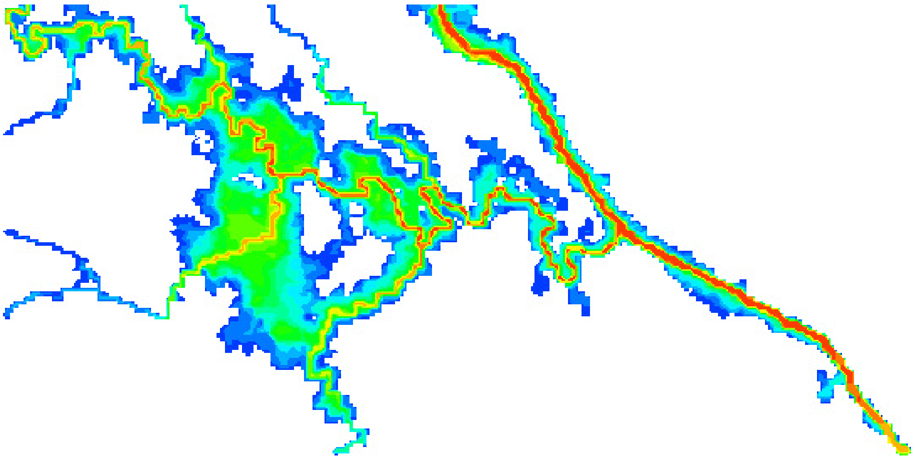


Figure 3.1.4. Location of stored water level (squared) and location of TS Point 3 (circle).



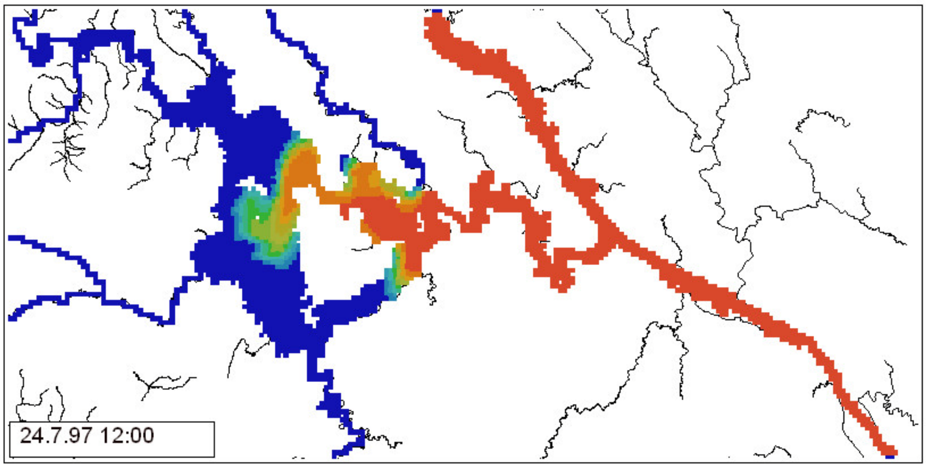


Figure 3.1.5. Flood depth on 20/09/2001 (top) and reverse flow during its maximum extent in 1997. Red is water from the Mekong, blue is water from the Nam Songkhram and its tributaries.

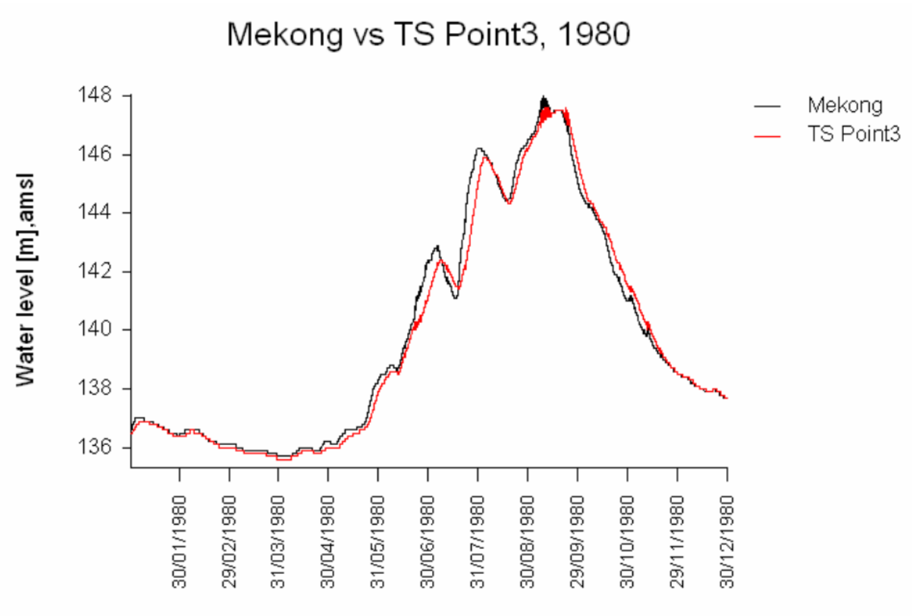


Figure 3.1.6. Water level in the Mekong mainstream plotted against water level in TS Point3.

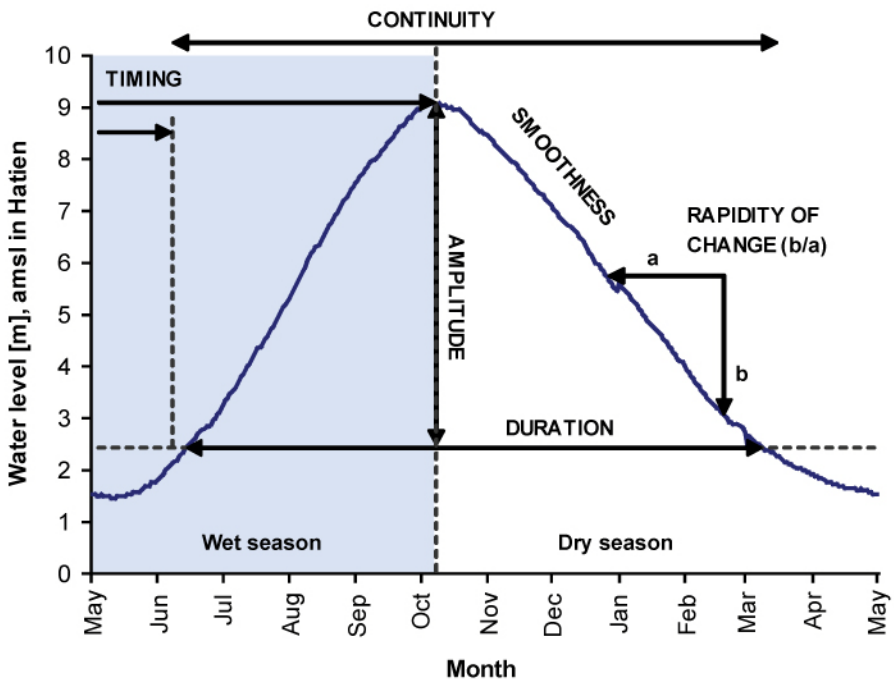


Figure 3.1.7. Flood pulse parameters (adapted from Lamberts and Bonheur 2007)

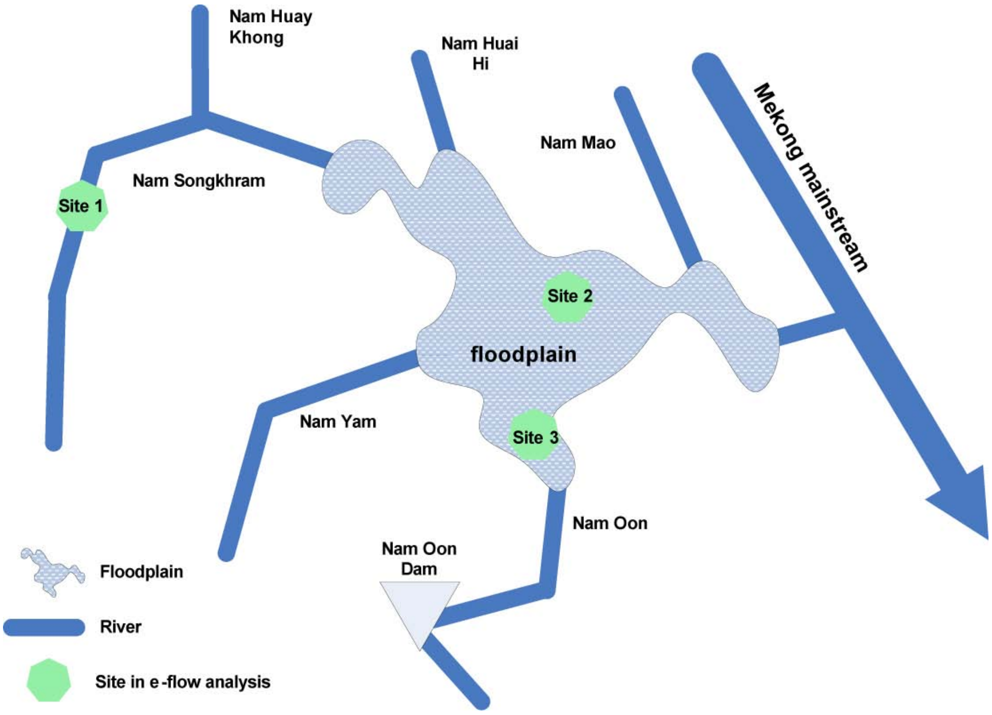


Figure 3.1.8. Schematic overview of the Nam Songkhram floodplain (not to scale).

The monthly values for simulated years are presented in

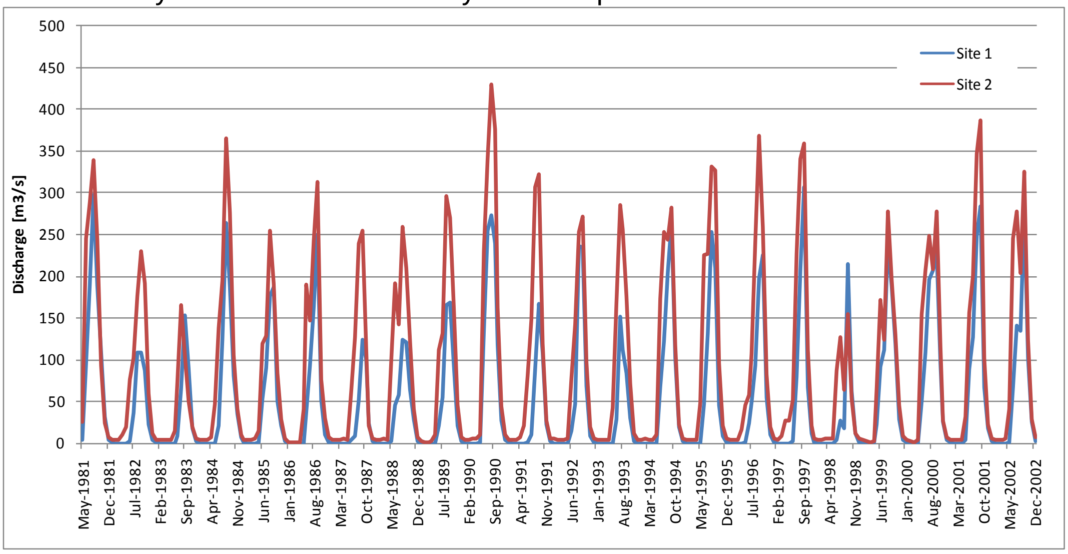


Figure 3.1.9. The peak discharge varies significantly between the years as can be seen.

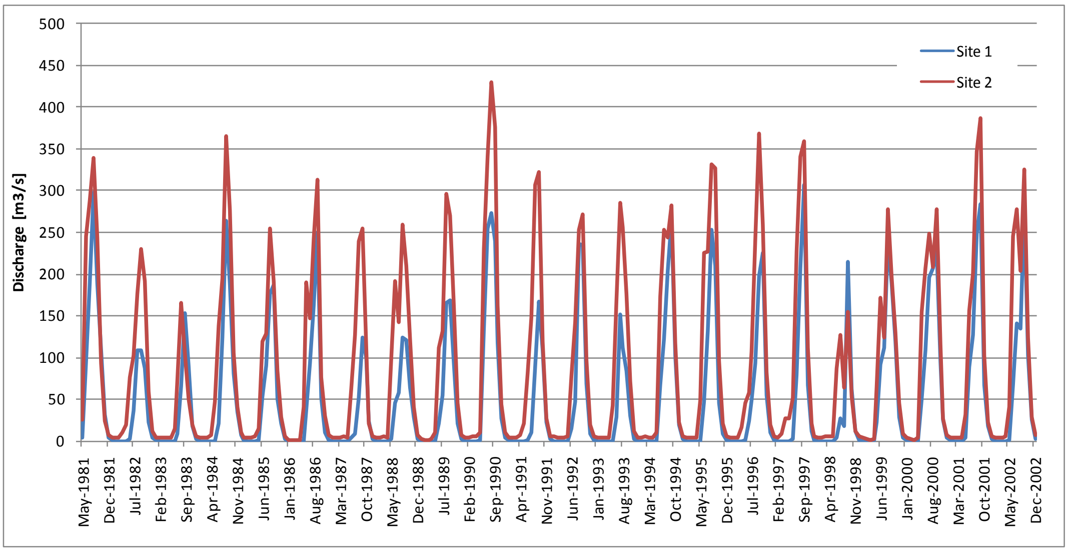


Figure 3.1.10. Monthly average discharge in study sites 1 and 2

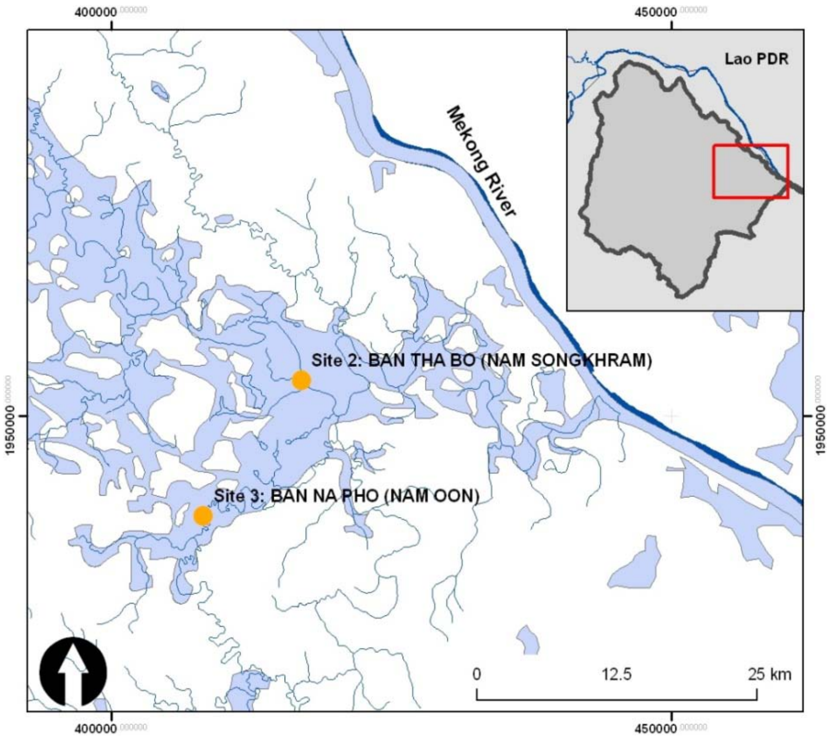


Figure 3.1.11. Floodplain areas and sites 2 and 3.

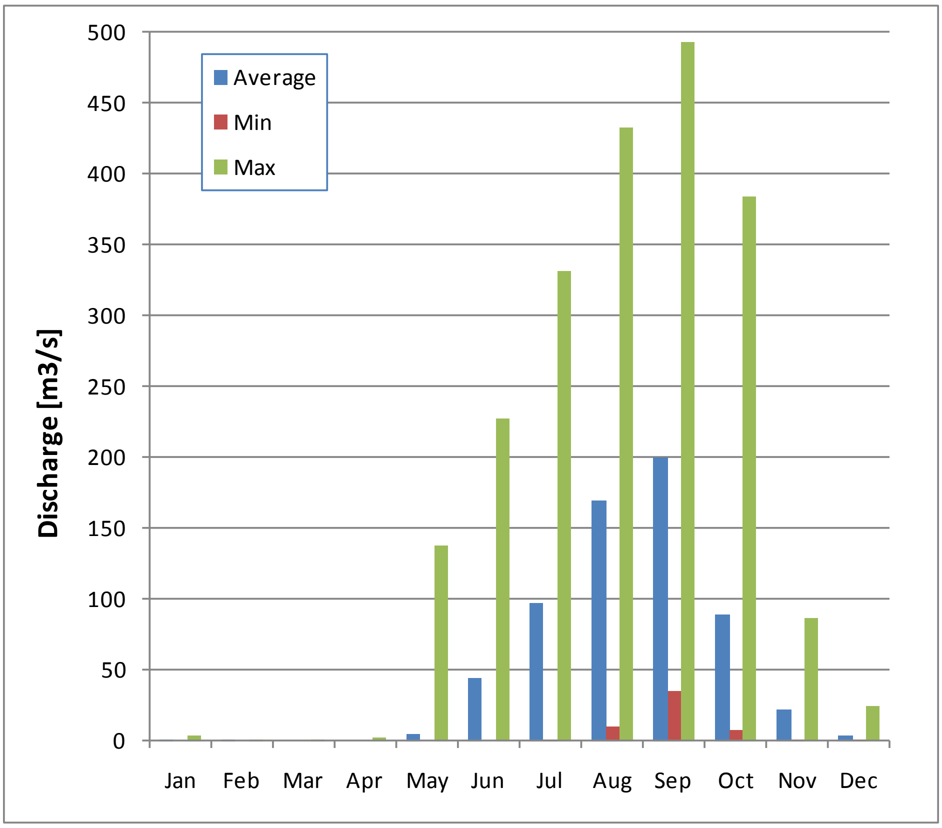


Figure 3.1.12. Variation of monthly average discharges at Site 1.

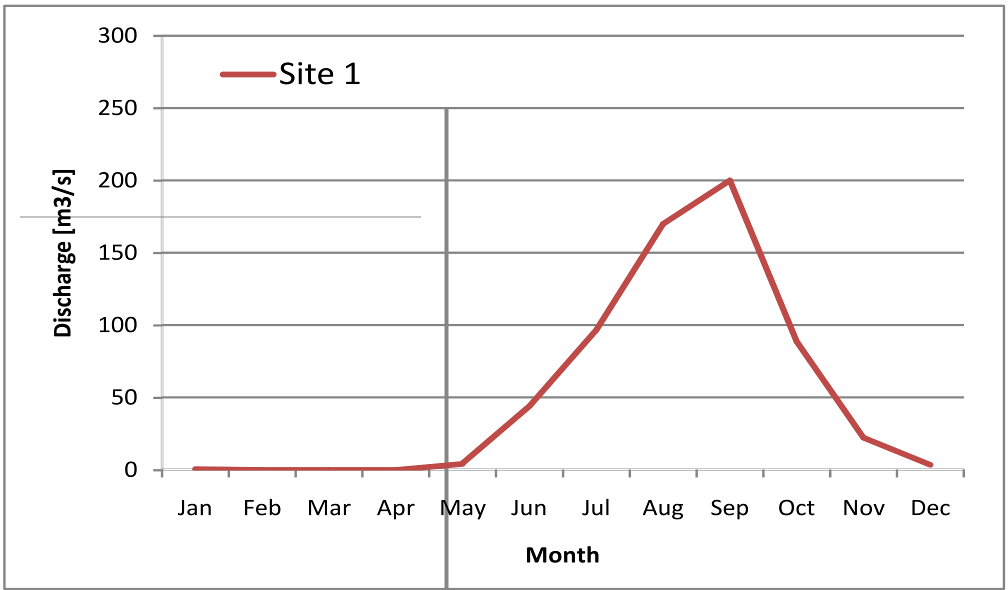


Figure 3.1.13. Monthly average discharge in study Site 1.

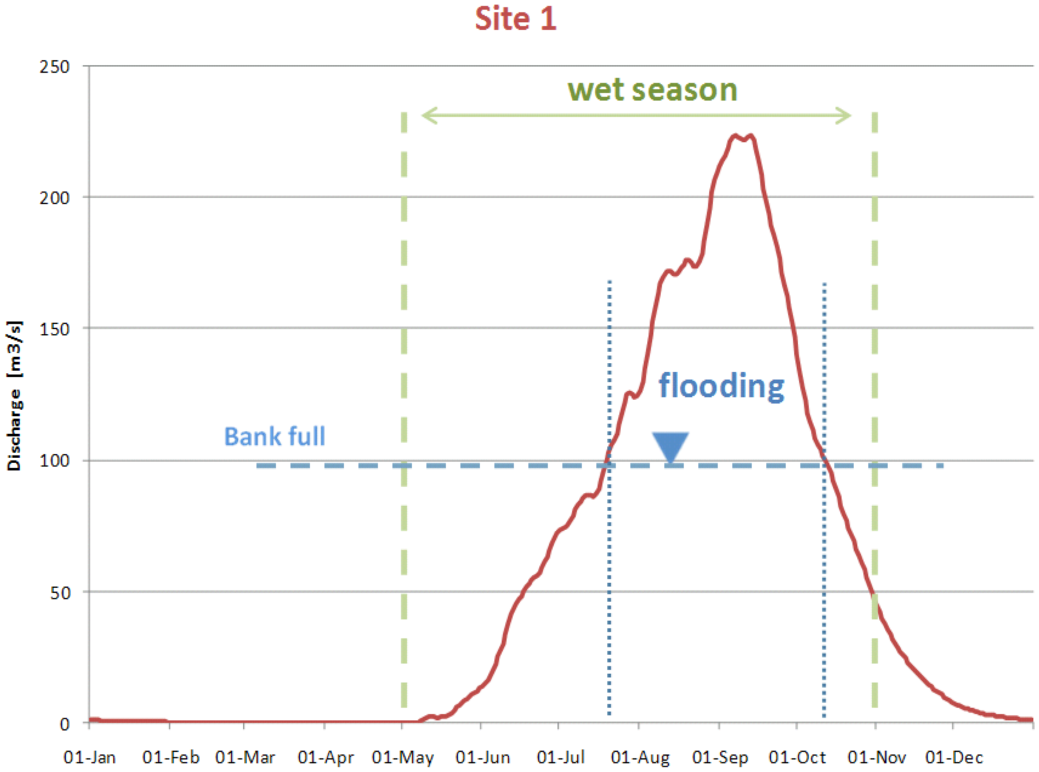


Figure 1.1.14. Hydrological characteristics in a hydrograph for Site 1.

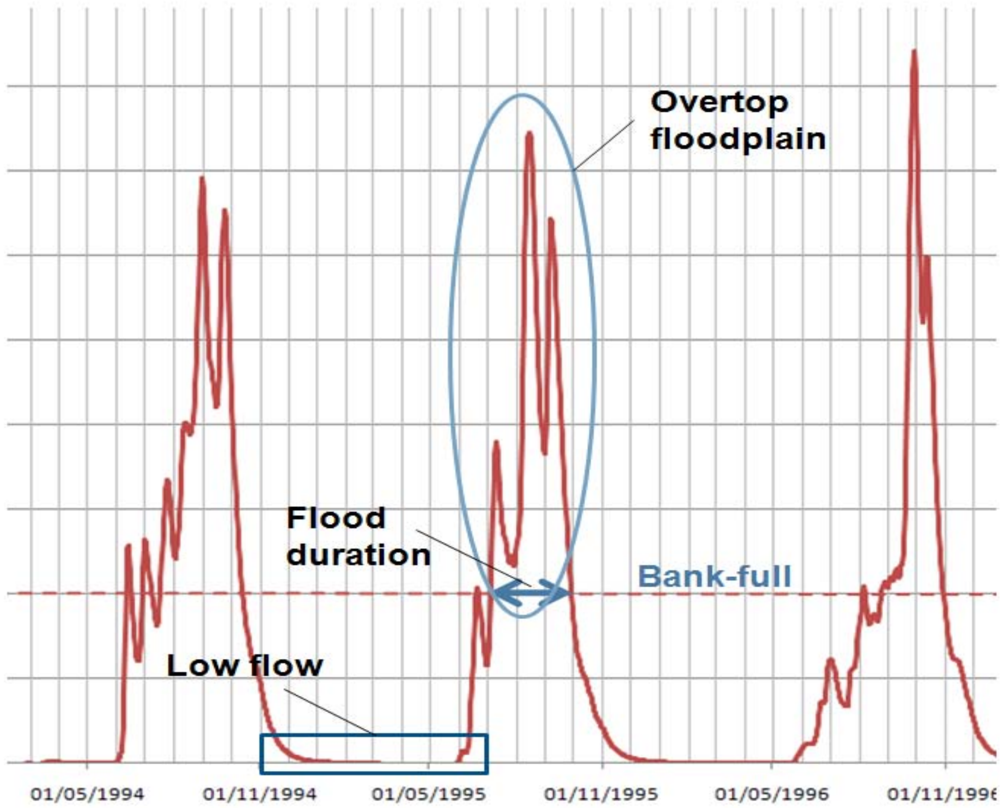


Figure 3.1.15. Example of the three year hydrograph for Site 1.

Complete hydrological analysis

The complete hydrological analysis follows: (Or the following ought to be chucked into an annex? It's awfully cluttered.)

Inter-annual floods

- 1:2 years 331 m^3/s
- 1:5 years 415 m^3/s

Intra-annual floods

Overtop floodplain peaks: Discharge over 100 m^3/s

- number of peaks 2.1 /year
- duration 2.7 months
- start mid July
- end mid October
- peak September

Small in-channel flood: Discharge over 30 m^3/s (Q90) but less than 100 m^3/s

- number of peaks 1.1 /year
- occurring mainly in June

Freshes

- number of peaks 0.9 /year
- occurring May - June

Low flows

- Wet season: Discharge between 30 (Q90) and 60 m^3/s (Q75)
- Dry season: Discharge between 1 m^3/s and 2 m^3/s

3.2 Fisheries & Aquatic Resources

Ubonrattana Suntornratana

Methodology

The methodology adopted for the fisheries component followed a standard Department of Fisheries survey procedure applied for a 2-day rapid assessment per site. The assessment used three basic methods, namely:

- *Species sampling using fixed gillnets.* These were conducted in both floodplain water bodies and the mainstream river. Gillnets were fixed overnight and species caught were identified, counted and measured for length the next morning. While gillnets are a selective method which do not allow sampling of deepwater or bottom-dwelling species and are size selective depending on mesh width, they do give a rapid indication of fish diversity and relative distribution in the study area. This can be considered a versatile and cost-effective sampling technique.
- *Interviews with local fishers.* These were done with the aid of a species checklist and photo flipchart guide[2], with each species checked for occurrence in five major habitat types: 1)

[2] This flipchart includes photos of 197 fish spp. from the Mekong River by the Department of Fisheries

mainstream river; 2) tributary streams; 3) back swamps (or oxbow lakes); 4) inundated floodplains; and 5) paddy fields. This obtained basic biological and ecological knowledge of each fish species, such as information about migratory behaviour.

- *Observations of local fishing activities at each station*. These included direct interviews with local villagers about their methods, household catch production and the general fisheries situation. Sometimes individuals would be interviewed. At other times a group discussion would be facilitated.

Samples of fish from each site were identified following the Mekong Fish Database of MRC (2003); Rainboth (1996); Kottelat (2001); Vidthayanon (2004).

Background to habitats, ecosystem and fish in the Nam Sogkhram River Basin

1. Habitats and fisheries ecology

The Nam Songkhram River ecosystem consists of various habitats of both channel and non-channel types including an extensive seasonally inundated zone. Where the riverbank or floodplain have high vegetation cover and diverse aquatic habitat features, fish fauna diversity tends to be high. Alternating periods of high flow and low flow, with longitudinal and lateral flow across a broad floodplain, initiate cycles of nutrient dispersal and uptake in the aquatic and terrestrial organism food webs. Additionally, flow regime events are a known environmental cue for triggering fish migrations and reproduction (Baran, 2006). For many fish species that utilize more than one habitat type to complete their lifecycle, connectivity between habitats is essential.

In terms of habitat type, biodiversity and faunal and floral distribution, the Songkhram Basin ecosystem is highly diverse. Following criteria taken from various river ecological studies, the Nam Songkhram River would be classified as a river-floodplain system controlled by an annual flood cycle which could be zoned by habitat functioning into at least 4 majors types, namely:

In-stream habitats of rivers and streams, including permanent and seasonal channel types of water bodies. Their physical characteristics and flow patterns are an important functional system for hydrological connection of various habitats in the Nam Songkhram river-floodplain system. River channels contribute water, nutrients and other inputs to the local habitat and the floodplain system. This hydrological function maintains fertility in the river system, providing accessibility of fish movement between various habitats and supporting spawning and nursing grounds for many fish species. Moreover, this accessibility is particularly important for supporting stock exchange between the Nam Songkhram River and the other inter-connected river systems of the Lower Mekong Basin.

The rich environment of the main Nam Songkhram channel not only allows the movement of local resident species but also the passage of many migratory Mekong species at both adult and juvenile stages. Some adult fishes have been reported to migrate for spawning, whereas many fingerlings of both shark catfish (*Pangasiidae*) and minnows and carp (*Cyprinidae*) species are reported to migrate for nursing and feeding on fertile inundated floodplain of the lower Nam Songkhram (Ratanachotmanee and Suntornratana, 2002; Suntornratana et al., 2002; Suntornratana et al. 2007; Boonyaratpalin et al. 2002).

As well as providing accessibility for upstream migration, the river/stream habitats also function as a downstream migratory route during the flood recession period. Empirical evidence clearly shows a peak downstream migration during fast receding flows at the end of the wet season in October/November. A survey undertaken in 2002 by the DOF studied fish stocks using stationary bagnet and stream barrage sampling methods. The effort was able to collect and identify 149 species, including so-called black and white fish species[3], representing native and non-native species migrating back from the floodplain into the Nam Songkhram and Mekong rivers (Boonyaratapalin et al, 2002),

[3] 'Black' and 'white' species of fish refer to rather broad distinctions made between fish that migrate relatively short distances to complete their lifecycle and are often present in the same wetlands area during all stages of their lifecycle (the 'black' species) and those fish which migrate long distances, and spawn far from the places they live for most of the year (the 'white' species).

The mainstream Nam Songkhram and its major tributaries are permanent water bodies that contribute to floods on adjacent floodplains when water levels rise and water is pushed over the riverbanks during the rainy season. This phenomenon in the Nam Songkhram is influenced by backwater (or even backflows) from the Mekong mainstream. This causes flooding over large areas of land from the middle stretches down to the lower parts of the basin providing increased fisheries habitat area for several months each year. After the floods, these river/stream channels become important dry-season refuge habitat during the dry season, maintaining fish stock and diversity as water levels and flow decline. In addition, there are also many small streams from sub-catchments that contribute to seasonal water flows and also act as important habitat refuges for some aquatic organisms that are adapted to cope with alternating periods of flood and drought.

Margins and pools are slow flowing water areas and habitats in the main river/stream channels. During the time of high flows and strong currents, juvenile fish and many small species, plus certain other aquatic organisms, are unable to cope with fast flowing conditions and rest in margins and pools. These also act as resting areas for fish moving or migrating upstream, helping them maintain their energy for swimming against the current. This is especially important for fish migrating upstream for reproduction, as the long distances they must swim may cause fatigue and decreased spawning success if energy stores (usually fatty deposits) are depleted.

During low water levels in the extended dry season, some downstream areas of the river/stream channel become slightly deeper pools. These areas then become habitats for fish to spend the dry season. This habitat is called a “dry season refuge habitat,” critical for adult and juvenile fish to survive until flows pick up again in late April and May.

Inundated floodplain areas adjacent to river and streams. These essential fisheries habitats are seasonally inundated when flow overtops the river banks and cover the lowland floodplain of the Nam Songkhram Basin. Sediment and nutrients that are carried down by currents meet low flows on the floodplain and start to settle out, to be utilized by phytoplankton and aquatic vegetation to start a food chain for many living organisms. With high natural food productivity, many temporary floodplain species of the *Cyprinidae* and other families enjoy high success rates of spawning and larval survival. Therefore, this area is considered a crucial component of their life cycles as it provides extensive reproduction and nursing habitats.

These inundated areas can be divided into two major sub-categories, namely bamboo-dominated flooded forest and flooded grassland which includes lowland paddy. These two areas are important for fisheries production. Flooded forest with bushes and shrubs is important habitat for many young fish as a nursing ground where young fish can hide from predators and are relatively safe from fishing gears. Paddy fields are an important spawning ground for many black fish species such as walking catfish (*Clarias* spp), climbing perch (*Anabas testudineus*), and butter catfish (*Ompok bimaculatus*).

Recent studies using Remote Sensing and Geographic Information System (GIS) techniques to classify important fisheries habitats in the lower part of the basin have determined that the extensive wetlands form more than 40 percent of the total area in the wet season (Hortle and Suntornratana, 2008). This area also included all fisheries habitats of both channel and non-channel type, all permanent water bodies and floodplain including lowland paddy field that contribute to fisheries production

Backswamps and permanent stillwater bodies which are scattered around the floodplain zone. The data for this type of habitat varies considerably between studies/surveys. Whatever the total area actually is, this habitat performs an important fishing ground function for local people in the dry season and is also a dry season refuge habitat for fish fauna. During visits to all three sites, swamps which had been flooded during the peak flood period in August – September, had become important fishing grounds in March, such as Huay Sing and Huay Bor in Ban Tha Bor; and Kud Dho in Ban Na Pho Noi.

Besides being important dry season refuge habitats to maintain aquatic life during long dry periods, these backsawmps are important as spawning and nursing habitats for various black fish species and some species not requiring strong flows to activate development of their reproductive organs. Families that are known to spawn in backswamp habitats include *Anabantidae, Nandidae* and *Channidae*. During the dry season there is estimated to be around 4 percent total area of river/stream and many discrete permanent stillwater bodies which are considered to be the main dry season refuge areas in the LSRB.

2. Fish life cycles in the Nam Songkhram

Fish life cycles are dynamic and require different habitats to support their behaviour at different stages of their life cycles. The Nam Songkhram river system, as a sub-basin of the Mekong, forms a complex ecosystem containing various river-floodplain habitats which should be considered not only in terms of local importance, but also their role as supporting the life cycle of many Mekong fish species.

Earlier studies have highlighted the presence of a high diversity of fish species including many Mekong species (Yingcharen and Virapat, 1998; Boonyaratpalin et al., 2003). This clearly shows the dependence of many Mekong fishes on the Nam Songkhram River for feeding, reproduction and/or nursing. At the same time, many local resident species also move between river/stream and permanent backswamps to the floodplain for feeding, reproduction and/or nursing. A simple diagram of fish life-cycles can be divided into four stages and at each stage, most species require a different habitat type to satisfy physiological needs and to maintain stock.

1. **Adult fish –** once mature, most species require suitable habitat type for reproductive activities. This behaviour is normally related to their physiology. Many cyprinids have buoyant eggs that require a strong flow to drift downstream in the river channel until hatching out as larvae. Apparently, stocks of adult fish in the Nam Songkhram River can be separated into two main groups, namely resident species and a migratory group of Mekong species.

2. **Larvae and juvenile -** this stage occurs after hatching up until the early stages of adult morphological development. Most larvae drift downstream before hatching in a suitable pool and/or slow flowing area or on inundated floodplain as the young fish are incapable of swimming against the current. This young stage prefers flow and also in the nursing ground habitat where they can hide from predators.

3. **Fingerlings -** are juvenile fish that have not yet developed reproductive organs. They can not swim against strong currents and also require suitable habitat to hide from predators. The seasonally flooded forest with thick undergrowth provides safety to juvenile fish from both fishers nets and predators. Many species spend this nursing stage on floodplains until the end of the flooding period. Downstream migration then occurs during the flood recession period as water drains the floodplain area into streams, rivers and backswamps.

4. **Adult and fingerling stage** - Local resident stock will mostly spend the dry season in dry reason refuge areas (e.g. riverine pools, oxbow lakes, backswamps, reservoirs, etc) coping with poor water quality conditions and low flows. Both adult and fingerlings will feed and develop to become broodfish in the next flooding season. The remaining stock are important sources of food and income for local villagers to catch through the dry season. Other long distance migratory fish spend the dry season in deep pools of the Mekong mainstream.

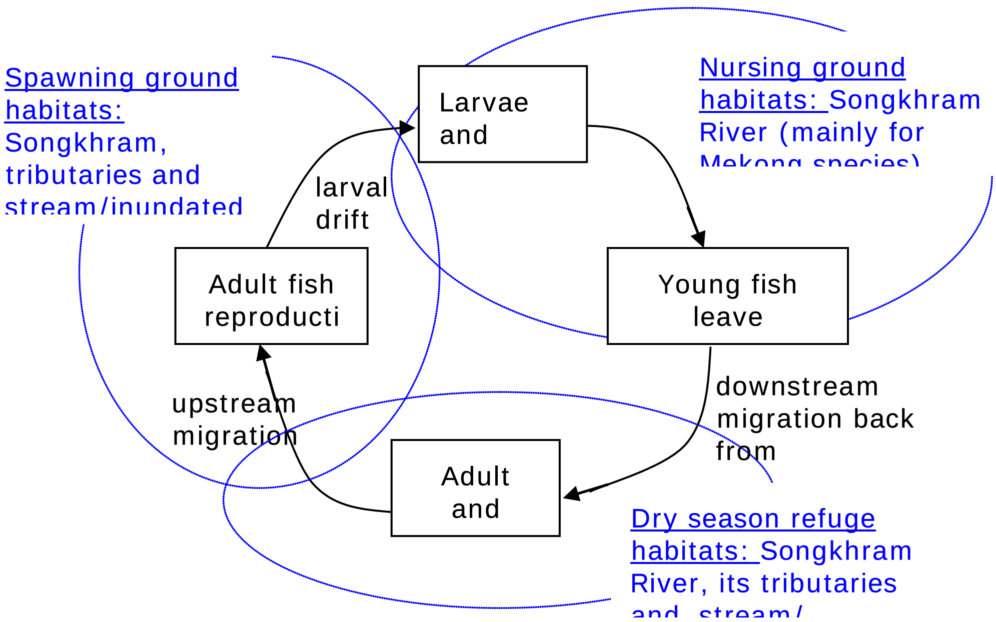


Figure 3.2.1. Fish migratory behaviour and links between various habitat types observed to complete their life-cycle

Apparently, some species will inhabit the same habitat for the whole of their life-cycle, but there are many more fish species that require more than one type of habitat to complete their life cycle. Mature, adult fish need the right kind of habitat for reproduction, while larvae and juvenile stages are more sensitive to flow changes. Surviving the long drought is essential to maintain natural stocks, which needs water of the right depth and quality. Therefore, all these habitats are in a state of seasonally dynamic hydrological and ecological flux within the Nam Songkhram Basin, which has helped to positively maintain a rich variety of fish species in the past and added to the productivity of the aquatic ecosystem.

3. Fish diversity and species composition

Diversity, when referring to both the variety of living organisms and habitats, can be a function of various ecological scales from macro to micro. There are two issues related to variety and variability to address, therefore, diversity can be used as an indicator to monitor ecological status and possibly predict the direction of change for the ecosystem, including a river-floodplain ecosystem like the Nam Songkhram. One major finding of the fisheries component is that it clearly shows a ***high diversity of freshwater fish*** present in the Nam Songkhram Basin and this indicates a complex-ecosystem that support living aquatic organisms including species of amphibian, crustacean, reptile, birds and many invertebrates.

Data gathered, under a medium-level assessment process, from sampling and observation at study sites in the wet and dry season showed a high diversity of fish fauna. A total 81 Species/Taxa belong to 22 Families within 11 Orders (Annex 5) were identified. Major orders represented were *Cypriniformes*, *Siluriformes* and *Perciformes* contained 48.2%, 22.2% and 13.6% of species respectively. And additional data from the survey using a Species Checklist during the first trip in the wet season, provided a total 139 Species of 30 Families within 12 Orders occurring in various habitat types of the river-floodplain system. High diversity of fish have been reported from various earlier surveys (Table 3.2.1) and when compared with other river systems in the Mekong Basin in the East and Northeast region of Thailand, this clearly shows a healthy functioning aquatic ecosystem in the Nam Songkhram Basin that serves to support a high diversity of fish fauna.

A list of species from the species checklist, sampling and observation of actual fisher's catches at each survey site, has been summarized to show species diversity in Table 3.2.2. Among the three sites, the Nam Songkhram showed higher fish diversity than the Nam Oon and there was higher diversity in the lower part of the Songkhram Basin than in the upper part. At Ban Tha Bor station (Site 2), in the lower Songkhram, there was high diversity present which could be attributed to environmental factors such as an extensive floodplain area containing various habitat types, including inundated flooded forest (some of which is relatively healthy), backswamps, flooded grassland and lowland paddy that function similar to a flooded grassland system.

Table 3.2.1. Summary of diversity from E-Flow survey and previous studies in the LSRB

Item	Other studies			E-Flow assessment for both wet and dry season (2007)
	DOF[4], Thailand (2002)	Catch monitoring[5] (AMCF 2004-2005)	Species Checklist[6] of fish in the Songkhram	
Year of survey	2002	2003-2004	1996-1997 and updated in 2006	2006-2007
Total number of species identified	149 Species/ 33 Families	110 Species/ 27 Families	193 Species/ 33 Families	81 Species/22 families from sampling and field observation 139 Species/30 Families included survey on species checklist

This area also is closer to the Mekong confluence (approximately 70 kms) which might influence the common occurrence of various Mekong species. A survey reported in Suntornratana et al (2002) found that 125 Mekong species were present in the river near Ban Tha Bor in fisher's catches. Some information was also obtained concerning the seasonal migration of the Giant Mekong Catfish (*Pangasianodon gigas*), an important and rare "flagship" species that can indicate environmental integrity, which enters the floodplain system around this Ban Tha Bor almost every year (please refer to Annex 11 for more details).

Table 3.2.2 Fish diversity from catch sampling and checklist identification in three villages from both wet and dry season surveys

River	Nam Songkhram				Nam Oon	
Station	Ban Kham Chi		2. Ban Tha Bor		3. Ban Na Pho Noi	
Survey approach	Checkli	Samples /	Checkli	Samples /	Checkli	Samples /

[4] The Department of Fisheries, Thailand conducted a survey using a Stationary Trawl Net and Stream Barrage to sample species in the lower Songkhram river, reported in Boonyaratpalin et al., 2002.

[5] The Assessment of Mekong Capture Fisheries Component under the support from Fisheries Program of Mekong River Commission and the Department of Fisheries, Thailand conducted survey to monitor catch in four villages in the lower part of the Songkhram Basin (unpublished data)

[6] The survey conducted to gather samples and specimens was in 1996 -1997 and additional information of was updated in 2006, but remains unpublished.

	st	Observations	st	Observations	st	Observations
Species / Families	70/20	38/12	109/27	68/21	63/21	32/14
Orders	7	6	10	11	8	7
Alien species / % of total		0/0		2/2.9		0/0

Additionally, information from local fishers provided during site visits indicated that some species have become locally extinct, especially large fish species within the riverine catfish families (i.e. *Pangasiidae, Sisoridae* and *Siluridae*) likely due to the degradation and areal reduction of flooded forest habitat in the Nam Songkhram Basin, but also from catch pressure, especially by use of large-scale and illegal fishing gears that are harmful to fisheries resources and habitats.

Species composition can be inferred from the species list by site. This study took catch samples and direct observation during study sites visits to simply visualize present stock in the LSRB. At all three sites, as shown in Figure 2, *Cyprinidae* was the major family represented forming around 47.4, 40.6 and 50.0 % of species per site respectively. This is in-line with commonly found species composition in freshwater/river ecosystems elsewhere in Thailand. Overall, 62 species from a total of 139 species were *Cyprinidae*, with more than 90 % of them commonly occurring in the Nam Songkhram river-floodplain system. This group of species comprises a significant amount of the total fishery production, yet still requires adequate flow in the river/stream channel and a fertile floodplain habitat to ensure successful reproduction and nursing conditions.

4. Natural fish stocks

The natural stock of fish fauna in the Nam Songkhram River Basin can be divided into two basic groups, namely localized species (“black”) and long-distance migratory fish species (“white”) from the Mekong mainstream. Both these stocks are influenced by environmental factors and ecological patterns of the Mekong-Songkhram river systems. In this study, groups of fishes have been categorized by conditions that are related to ecological aspects in order to visualize stock patterns in the Nam Songkhram and assess possible impacts resulting from any future changes of the river-floodplain ecosystem.

The present fisheries ecology situation in the Nam Songkhram Basin in terms of the condition of the floodplain system is still relatively healthy, with little evidence of alien species being common in catches. There were only two exotic species found during site visits, namely tilapia (*O. niloticus*) and common carp (*C. carpio*). These alien species escape from aquaculture systems that are common in the Songkhram, especially cage culture of tilapia along the river’s lower reaches. Interestingly, there was no evidence of exotic species taken from samples and field observations at the Nam Oon station, although this does not preclude their presence.

5.Fisheries status and possible impacts to fisheries sector from flow regime changes

Fisheries is one of several important livelihood sectors in the Nam Songkhram River Basin, but unlike agriculture has tended to be undervalued in the past. Local communities have developed a floodplain dependent culture where the inhabitants have learnt how to live with and to successfully utilize resources in the wetland areas, especially fish and living aquatic resources. The Nam Songkhram Basin is recognized as a highly productive area, which produces during and after every flooding cycle a huge amount of aquatic production from the river-floodplain system supplying food and income to local people.

Fisheries production comes from various habitats on the Nam Songkhram river-floodplain ecosystem, for which local villagers have developed and modified specific fishing gears and activities to trap and catch fish and other aquatic animals. It is known that there are at least 79 gear types used to catch fish in the Lower Songkhram River Basin (Tai Baan Research Network of the Lower Songkhram River

Basin, 2005), but about 10 types of gear are most commonly used, especially the ubiquitous cast net and gillnets.

A reported 60 percent plus of households in the LSRB own these two major gears, whereas the large gear like fixed bagnets are owned by only around 4 percent of sampled households (Hortle and Suntornratana, 2008). During both wet and dry season site visits, gillnets were being used widely at all three stations and the majority of villagers were thought to be fishing mostly for their own household consumption. Villagers who fish primarily for income were mostly limited to Ban Tha Bor, where boats are much bigger than the other two villages and evidence of large gears is seen under houses and stationed in the river or floodplain habitats.

Fishing activities in the Songkhram wetlands occur all year round, but there are definite seasons when activity peaks, according to key migratory periods. In the main channel of the Songkhram River and major tributaries like the Nam Oon, it becomes difficult during the wet season to operate many gears because of the flow and depth. Local fishers claim they catch less in the main channel during highwater conditions and mostly the catch consists of big riverine species which are migrating upstream. Therefore, inundated areas on the floodplain become an important alternative fishing habitat during high flow in river/stream. Catches peak at two periods for fishers, namely the beginning of the wet season when upstream migration of fish begins in the main channel and at the flood recession period when fish are moving off the flooplain.

Large gears like the stationary bagnet (*dtong*) and stream barrage net (*gat-dton*) are mostly used during flood recession periods and intercept fish migrating off the floodplain and back in to the main channel. Beach seines (*mong kwat*) are mostly found to operate during the dry season and in the early wet season principally in the mainstream Songkhram and backswamp areas. The team observed one in use at Huay Sing near Ban Tha Bor in the dry season study and noted that there was considerable disagreement amongst local people about their use, with some villagers wanting them banned while other villagers (the beneficiaries) arguing that they are not destructive compared to other methods found. All these big gear are thought to be a cause of pressure on stocks of adult and juvenile fish that are negative for future stock recruitment and fishery management.

3.3 Land Use and Agriculture

Mongkhon Ta-oun

Methodology

The assessment included two field visits to the study sites in the wet and dry seasons. At each site the specialist took soil samples from cultivated areas, especially rice fields, for later analysis of chemical and physical properties; interviewed key informants such as village headmen and local leaders (at least 5 people in each area); as well as desk research on agricultural information, to access soil series and land use maps in the Songkhram River Basin (from various governmental agencies), especially in the respective sub-districts of the study sites. The main aim of this assessment was to find out the current agricultural situation, soil types of the three survey sites and where possible, relate these to considerations of flow and ecosystems.

Overview of sites

Site 1) Upper part of the Songkhram River Basin, Baan Kham Chi, Udom-porn Sub-District, Fao Rai District, Nongkhai Province.

The soil nutrients at Site 1 would appear to be of relatively low fertility compared with the level of soil nutrients in the lower two sites. Observations and local interviews revealed that agriculture and land use at the three sites has changed emphasis between the years 2000 and 2006 from upland cash crops, such as sugarcane and cassava, to growing para-rubber and eucalyptus over significant areas. While paddy fields are still the main land use and interest of villagers, there are signs that there is a switch of focus by farmers from wet season rainfed to dry season irrigated rice cultivation. Eucalyptus plantations are gradually replacing paddy fields at Site 1 and Site 2 and are expanding continuously both in upland and lowland/floodplain areas. Livestock numbers, such as cattle and buffalo, have tended to increase in the short term in some villages, although there has been a long-term decline in economic importance over the last thirty years.

The average rice farming yield in the sub-district was about 2,700 kg/ha. It was noted that land use for other cash crops, such as sugar cane and cassava were relatively insignificant compared to rice cultivation; while monocrop tree plantations such as eucalyptus and rubber accounted for 1,504 and 342 ha respectively, with most of the eucalyptus area found in Ban Kham Chi, as shown in Figure 1, Annex 3[7].

It was found from personal interviews with community leaders that large numbers of villagers are investing in monocrop tree plantations, mainly due to the perceived financial benefits. Villagers traditionally raised large livestock (buffalo and cattle), on common grazing land, but these areas are declining fast as land is converted to monocrop tree plantations and it can be assumed that numbers will decrease in future. While secondary data suggested there were 70 families involved in fishing in Ban Kham Chi, according to an interview with the village headman there is actually only one family that primarily earns its livelihood from fishing. In the past, villagers depended far more on the river and floodplain fishery for livelihoods than at present. According to records from 2000, it was found that cassava and sugarcane were more widely cultivated than at present, but their popularity has declined in favour of conversion to rubber and eucalyptus plantations. The latter are being planted on floodplain areas right up to the edge of the Songkhram River, with large swathes of land being converted during the dry season site visit. In the rainy season (Sept 2006), eucalyptus plantations near the Dong Mor Tong bridge (Site 1) were inundated by floodwaters, but had clearly suffered no ill effects when the team revisited in March 2007, attesting to this tree species' resilience to floods. Similarly, eucalyptus can also survive severe drought and forest fire.

Site 2) Lower Part of the Songkhram River Basin near Ban Tha Bor, Tha Bor Songkhram Sub-district, Sri Songkhram District, Nakon Phanom Province.

The total area of the Sub-district is 5,364 ha, which is divided into 3,368 ha of cultivated land and non-agricultural land of 1,996 ha or 37.21%, which is mostly classified as back swamp, bamboo forest and seasonally inundated areas. Data from 2005 showed that rice fields were most common and made up 76.03% or 2,561 ha, with 835 families (out of 869 families) involved in this activity. Average rice yield was about 2,300 kg/ha.

Of a total of 869 families in the seven villages of Tha Bor Songkhram Sub-district, 360 families are reportedly involved in fisheries[8]. A few families have dug fish ponds with support from a royally-initiated project and there are several small fish processing facilities (mostly producing sour fermented fish or *pla som* from non-local cultured fish) in Ban Tha Bor. Cassava cultivation has sharply declined in recent years due to lower demand, while there has been rapid growth in household-level eucalytpus plantations at the same time. Villagers have planted eucalyptus on floodplain land right up to the edge of the riverbank and lakes, apparently motivated by the returns available from selling cut stems to agents of the pulp and paper industry, who regularly visit villages looking for raw material. A lack of household labor, high local labor prices and desire to show ownership of land by planting trees, as well as the species' hardy characteristics are other likely motivating factors encouraging the adoption of eucalyptus.

Site 3) Lower reaches of the Nam Oon River, Ban Na Pho Noi, Pon Sawang Sub-District, Sri Songkhram District, Nakon Phanom Province (see Fig XX)

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[7] Note this data should be treated with caution due to the apparently high figure for eucalyptus plantation in Ban Kham Chi compared to other villages

[8] Ed's Note: This figure would seem to be on the low side, as most families can be observed to participate in capture fisheries, at least on a seasonal or part-time basis. Other recent studies of the LSRB have suggested participation rates in the fishery of 80 – 93 % on a part-time basis (e.g. Hortle and Suntornratana, 2008)

Overall area of Pon Sawang sub-district is 2,931 ha, with a cultivated area of 2,484 ha, and a non-agricultural area of 446 ha or 15.23 %. Average rice yield was about 2,300 kg/ha. Other forms of arable land use such as sugarcane and cassava cultivation were very low. Recent observations show that both eucalyptus and rubber are expanding in the sub-district, apparently due to perceived good prices. Interviews with villagers in Ban Na Pho indicated that there are around 100 families involved in fisheries, at least part-time livelihoods, but other activities provided their main livelihood. In 2000, the secondary data showed that cassava was widely cultivated, as shown in Figure 5, Annex 3, but it has declined rapidly in the past few years, to be replaced by industrial tree crops. It was found that as the younger generation have migrated out the village to big cities and abroad for work opportunities, families are less likely to plant crops which have intensive labor requirements. The same factor also applies to rice cultivation, but rather than abandoning it altogether, farmers have adapted by using direct seed broadcasting, instead of the traditional and more labor-intensive transplanting technique.

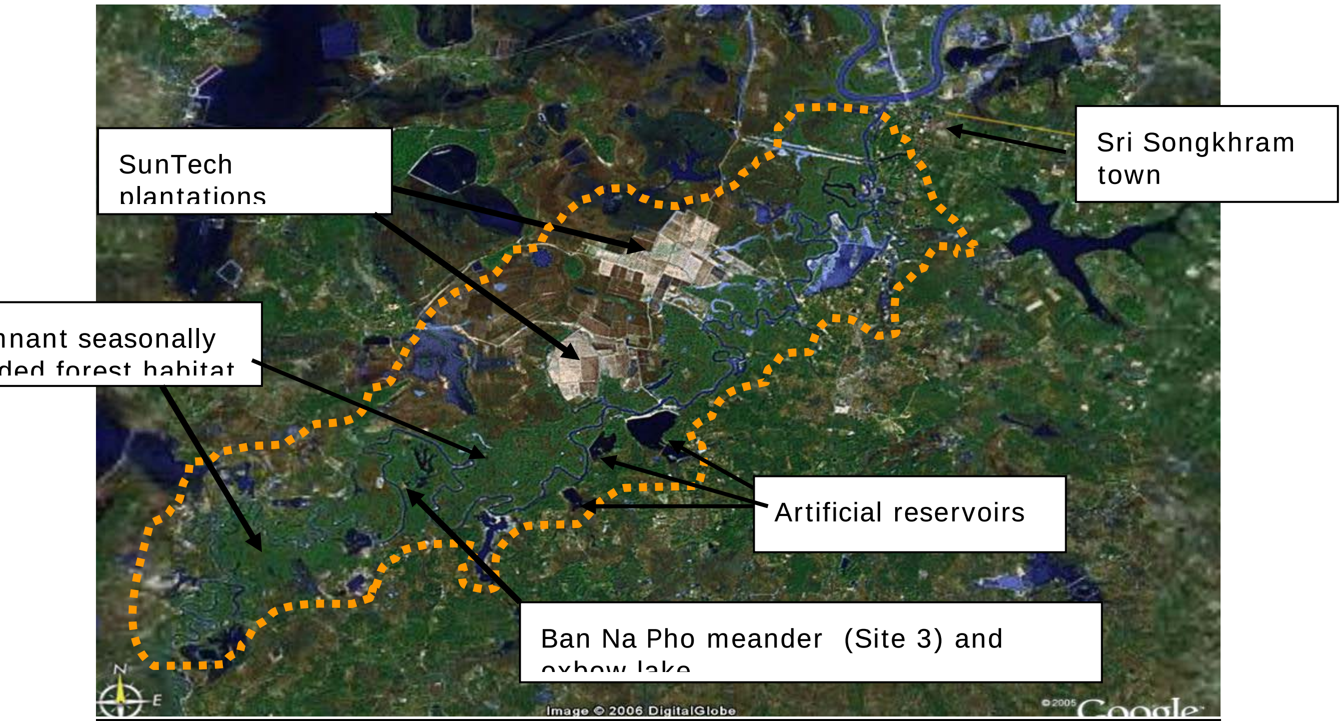

Figure 3.3.1. Land use on the lower Nam Oon floodplain (Site 3) in the dry season – e.g. showing permanent river, oxbow lakes, backswamps, seasonally flooded forest, artificial lakes, seasonally flooded agricultural land, intensively irrigated land, abandoned blocks, etc.

Land use changes in the Nam Songkhram river basin between the rainy and dry seasons (2006-2007)

1. Wetland changes from seasonally inundated forest to dry season irrigated rice

The bamboo-dominated seasonally inundated forest is being cleared at present in order to open land for dry season rice cultivation, chiefly as a result of the following main factors:

1. High prices of rice in 2006/07. In particular glutinous rice fetched good market prices buoyed by high demand from Vietnam and China during the “Year of the Pig”[9]. Some glutinous rice varieties (e.g. RD 6) reached 120-130 baht/12 kg (or *meun*), compared to 110 baht/12 kg for jasmine rice.
2. The dry season rice crop generally gives higher yields than the wet season crop, and is not prone to flood damage. On average, the improved rice variety known as “*Lao daek*” yields approximately 400-600 kg/rai in the Nam Songkram river basin but can attain yields up to 700-1,000

[9] Source: Sansonthi Boonyothayan, personal communication, March 2007

kg/rai in the first year following forest removal and land clearance, before soils start to lose their fertility in subsequent years. Particularly in the floodplain area of Site 3, some farmers with cultivated paddy fields claimed to be able to produce a dry season rice crop of 1,000 kg/rai. These high initial yields attract other farmers to clear more land and expand the agricultural frontier to its local limits.

3. The ease of conversion of seasonally flooded forest to paddy land with bunds has become more rapid and simple since the increased availability of powerful tractors within the village. The costs in early 2007 for using a tractor for clearance work was about 1,000 baht/rai for brush and bamboo clearance; 2,500 baht/rai for total clearance of all large trees, stumps and remaining vegetation; and 4,000 – 4,500 baht/rai for full clearance and creation of paddy fields with bunds, ready to cultivate.

4. Policy inducements and perverse subsidies. There has been indirect funding available from various state agency sources to support the conversion of seasonally flooded forest into paddy fields, in-line with central government policy. In particular, projects initiated under the Thaksin Shinawatra government such as the "Assets to Capital" project, One Million Baht per Village Fund" and "Farmer Loan Restructuring Fund" have all served to encourage the conversion of remaining natural forest land to agricultural purposes over the last five years. Large budgets have been provided by several provincial level departments and the local Sub-District Administration Organisations (TAO) to implement irrigated rice projects, which further encourage flooded forest conversion to agriculture. Furthermore, a policy of offering compensation for farmers for rice crops lost to flooding in commonly flooded areas (by declaring a natural flood event a "natural disaster") has further encouraged forest clearance for paddy fields (see Blake and Pitakthepsombut, 2006b).

The sustainability of dry season rice in the medium to longer term is in question, due not only to the fluctuating prices of rice and declining yields mentioned, but also the rising input prices for farmers, especially fuel, fertiliser and most importantly, labor, which is now the most critical factor influencing farmer's decision-making over landuse. As out-migration from the village has continued apace there is gradually less labor available to help with tasks such as field preparation, ploughing and harvest, increasing the workload of an aging farming population.

2. Soil erosion along the Songkhram riverbanks caused by encroachment and destruction of seasonally flooded forest

It was found that at Site 3 there was relatively more active soil erosion occurring along the main channel of the Nam Oon than at Site 1 and 2[10]. The majority of farmers pointed to deforestation of seasonally flooded forest as a cause in recent years for the drying up of the river and collapse of its riverbanks. The majority of farmers remarked that deforestation of seasonally flooded forest had caused the Songkhram River to run dryer in recent years and its riverbank to collapse. Anecdotal reports suggest that the Nam Songkhram River is gradually becoming wider but shallower over time, due to frequent bank collapses and sedimentation. According to the survey observations in 2006-2007, extensive bamboo stands had become scarce. In 1977-1979 the bamboo forest flowered en masse and the mature plants died-off, after which a new generation of bamboo clumps grew up.

3. Protection and conservation of the bamboo forest in the Nam Songkram river basin wetlands

It was found that Site 2 has introduced more wetland protection and conservation measures than the other two sites, through the efforts of local villagers and supporting organisations. Such measures as demarcating and classifying the wetland conservation areas (e.g. flooded forest bordering Huay Sing) may have helped to reduce conversion of land to agriculture in recent years. At Site 2, public water resources are clearly identified to protect against encroachment, but the previously public land on and near Tung Mon has nearly all been claimed by private interests now (agribusiness and local people), allowing little space for conservation activities.

[10] The main factor causing bank erosion and increased level of turbidity during the dry season in the Nam Oon, is likely to be the increased flow levels and flow fluctuations caused by the upstream release of waters from the Nam Oon Dam and irrigation scheme.

Ongoing changes in agricultural land utilization

The change from upland cash crops to other uses

Agricultural land utilization in the early 1980s was almost entirely devoted to cassava and sugarcane cultivation on the upper terrace soils of the Songkhram Basin. Both these cash crops have seen a general decline in relative profitability and productivity over the last few decades. Currently, there are only one or two families left in each village near Ban Kham Chi which still cultivate sugarcane, mostly those farmers with plenty of land available (e.g. over 100 rai) who can afford to diversify crops. By contrast, with cassava cultivation it seems to be only small-scale farmers with little land available that still cultivate it. Nowadays there is a trend to growing less cassava due to the fact that yield per rai has declined to only 1-2 tons/rai compared to around 4-5 tons/rai in the past, mostly because of decreasing soil fertility and poor land management. Presently, large areas of former cash crop land are being converted to eucalyptus plantations, especially at Site 1, but also at Site 2 to a lesser extent. Each family grows around 10-20 rai of eucalyptus on average. At Site 3, para rubber trees predominate over eucalyptus as there is more upland terraces available.

The alteration of upland and lowland fields into eucalyptus forest

Small-scale eucalyptus cultivation in the Songkhram Basin started in 1987 with a pilot project promoting tree cultivation on “unused” arable land by supplying just 5-10 eucalyptus seedlings per household from the Ministry of Agriculture and Cooperatives. Six years later in 1993-1994, eucalyptus trees started to be cultivated on a larger scale from 6-10 rai/household and by 2005-2006, most families were growing eucalyptus trees on their land, encouraged by neighbour’s stories of easy profits with little labor input. Some farmers have converted over 50 % of their land holding, including paddy fields, into eucalyptus plantation which does not bode well for future food security in the villages concerned.

In villages such as Ban Kham Chi in the upper Basin, nearly all households have land devoted to eucalyptus plantations, and the survey team witnessed many households actively propagating eucalyptus seedlings for future planting. Amongst the main reasons given for the popularity amongst villagers for eucalyptus plantation are:

1) **Convenience of sale**. It is unnecessary for villagers to search for a market to sell eucalyptus since middlemen will directly approach growers and offer to cut and remove the timber at an inclusive price. If the villager cuts the trees and sells directly to a buyer they will receive around 1000 baht/ton in 2007. The recommended planting rate is approximately 300-400 seedlings/rai.

2) **A perceived high financial return from eucalyptus**. On average, the yield from a plantation is around 10-15 tons/rai after planting for only three or four years which gives a return of about 10,000-15,000 baht/rai. A second and third harvest is possible for little extra investment, apart from pruning branches, although these yields will be less than the first. Compared with other crops, eucalyptus requires less on-going cash costs after the initial investment and the economics appear attractive to farmers.

3) **Decentralization of technology for eucalyptus seedling propagation** to the household level. Previously, eucalyptus seedlings were only available from government or large private nurseries, but in the past few years, private companies interested in promoting eucalyptus plantations have disseminated the technology to villagers at the local level, so central nurseries have been much downsized. Villagers grow seedlings for their own needs and sell commercially to others, at a price of around 1 baht/plant. This is providing some households with a supplementary income source.

4) **Flood and drought tolerance**. Due to uncertainties about flood levels from year to year, there is a high element of risk to wet season rice cultivation on the floodplain. This risk factor with rice has

encouraged farmers to switch to eucalyptus, which can tolerate flooding periods of up to three months, once the trees are over one year old. During the flooding period, pink or light violet leaves may be seen on the trees, which is a symptom of phosphorus deficiency in deoxygenated conditions. However, they quickly recover in the dry season and tolerate long periods of no rainfall, using groundwater to quite a depth sub-surface.

5) **Declining rice yields**. As cultivation practices have changed (e.g. switch from seedling transplanting to direct seeding, less manual weeding, larger fields) encouraged by labor shortages from out-migration and rising price of hired labor, so yields have tended to fall. This in turn has encouraged farmers to switch to eucalyptus on the former paddies, and some households are now being obliged to buy rice instead of growing it themselves. However, because of the long period between harvests of eucalyptus, this means the money to buy rice must generally come from off-farm sources, further encouraging labor migration.

Although eucalyptus plantations have become commonplace, generating a new source of income for villagers, some people the survey team spoke with expressed concerns relating to the environmental impacts of this trend. Some of the impacts mentioned, included:

- Eucalyptus plantations near water sources may cause a decrease in fish productivity, noted by fishermen, thought to be caused by the release of oils from fallen leaves being released into streams, swamps and ponds, which fish detect and avoid. However, the fish decline may also stem from the change of growing rice from transplanting to direct seeding which requires use of more pesticides to be effective. In particularly, farmers will commonly use a herbicide with the name, "*red pill*" or "*red dog*" (the local name for the broad spectrum herbicide 2-4 D), which has a bad smell. Some farmers who need to reduce costs of ploughing will buy the herbicide in liquid form to spray on grass and weeds before cultivating rice. Some prefer to spray on the paddy bunds to get rid of grass or destroy insect habitats. Consequently, when rain falls, it will carry this chemical or other pesticides into water resources, which may be detrimental to aquatic life.

- Villagers who plant eucalyptus trees near paddy fields, especially in sandy or laterite soils, have observed declining rice yields apparently from 50 – 150 kg/rai. This might be caused by the decomposition of eucalyptus leaves causing release of toxic organic substances or it might be from nutrient and water competition from the deep eucalyptus roots. On areas with heavy or clay soils, apparently the effects on rice yields are less noticeable.

- Eucalyptus planted next to sugarcane plantation will depress yields, in particular with trees over 5 years old which have a higher shading impact and will compete with the sugarcane for soil nutrients and water.

- Elderly people remarked that large-scale eucalyptus plantations lead to less rainfall compared to natural forest or para-rubber plantations. They believe this may be related to greater moisture levels and cooler temperatures found under natural forest or para-rubber plantations compared to eucalyptus plantations. Some farmers note that eucalyptus consumes more water than other plants and may cause surrounding areas to become dryer. It was noticed that when cutting down the 3-5 year-old eucalyptus trees, there is plentiful water released from their stems particularly in swampy or low-lying land.

Vegetable cultivation in dry season or cash crops after rice harvest

It was found that at Site 2 near Ban Tha Bor, around 7-8 households were involved in the cultivation of dry season intensive watermelon and vegetables, while at Site 3 there was some limited maize and vegetable cultivation near the Nam Oon river. By contrast, at Site 1 there were notably few vegetables cultivated by villagers, with the exception of some small scale growing of vegetables by farm ponds and one elderly farmer growing sweet potato on the Nam Songkhram riverbanks. The farmers in Ban Kham Chi were only growing a few vegetables for home consumption, while the majority of villagers now rely on the outside market for their needs, with pick-up trucks from outside the village selling a variety of vegetables on a daily basis. This illustrates a rapid decline in self-reliance of many villages, which was once considered a defining feature of Northeast Thailand (e.g. Nartsupha, 1984).

Problems of saline soil

The Nam Songkhram Basin is underlain with extensive salt deposits, which in some places rise to near the surface and may be exploited commercially, such as in parts of Ban Dung District, Udon Thani and Wanon Niwat District, Sakhon Nakhon. Locally, saline soil or underground water sources is a problem at many locations throughout the basin. The survey team found that underground rock salt had risen to the surface forming patches of surface crust of salt at Site 3 (Ban Na Pho Noi), near to the Nong Paen Reservoir, but was limited to a small area. This may be related to rises in water table caused by the reservoir, bringing salt to the surface through capillary action.

Migration of agricultural labor from land utilization changes

There is active labor migration to urban areas such as Bangkok, Rayong, Chonburi, Phuket, and also abroad (e.g. Singapore), particularly by teenagers and young adults in all three villages. Within the village mainly old people tend to remain, along with children and some adults who still tend farmland, mind children or work locally as laborers. This pattern was most noticeable in Ban Kham Chi of the three sites visited and is both a result of and leads to further land use changes. For example, as labor moves out of the village, there are fewer people to tend the fields and farmers look to labor saving crops or technologies. This encourages switches from small to larger tractors for ploughing or from rice to eucalyptus plantations, for instance. This in turn decreases the need for local labor and further out-migration occurs in a vicious cycle. People who return from living in the city tend to want quick profits and easy returns on money and labor invested, with little time for soil and water conservation techniques or care for the natural environment. However, initiatives like the Tai Baan Research that was carried out in Ban Tha Bor (Site 2) and other villages in Sri Songkhram District, show that there is still interest in protecting natural resources and maintaining or reviving traditional livelihood practices and patterns amongst many village residents (Tai Baan Research Network of the Lower Songkhram River Basin, 2005).

Agricultural land usage priorities in the Songkhram River Basin

The land use priorities of farmers in the Songkhram River Basin have changed over time, predominantly in response to wider socio-economic changes. Currently farmers are switching attention from farming not only raised terrace lands, but transforming the floodplain areas previously considered common property land of little agricultural value. These areas were formerly chiefly used for fishing, gathering NTFPs and livestock grazing, while paddy fields were mostly found on elevated lands above the regular flood level. But as population pressure has increased and land prices have risen, people have cleared more floodplain land and practiced “*naa siang*” (literally means “risky rice cultivation”). This practice has been encouraged by government policy which granted cash compensation to villagers who lost crops to flooding, even when the causes were totally natural, by declaring the floods as “natural disasters”.

Other policies which have encouraged the conversion and massive clearance of seasonally flooded forest to rice fields, has been the strong emphasis placed by many state agencies on irrigated dry season rice cultivation with generous subsidies given for irrigation infrastructure construction, the land reform policies of ALRO and long standing misclassification of floodplain forests as “vacant wasteland” or “degraded scrubland” and general lack of recognition of the value of natural wetlands by nearly all state agencies. In recent years, these policies have been compounded by the growth in power and influence of the pulp and paper industry, which has helped encourage villagers to plant eucalyptus on both upland and floodplain lands. Additionally, promotion of rubber growing in the upper Northeast by state agencies has led to wide adoption of rubber by a majority of farmers in some wetland marginal villages (e.g. Ban Kham Chi) in a relatively short period of time.

3.4 Vegetation component

Pattaraporn Waleetorncheepsawat

Introduction

For the vegetation component of the E-Flows study, given the known importance of the seasonally flooded forest from a biodiversity and livelihoods perspective (Tai Baan Research Network of Lower Songkhram Basin, 2005; Blake and Pitakethepsombut, 2006), it was a good opportunity to look at the present situation regarding floodplain vegetation at several representative sites and relate this to past and present trends of habitat and vegetation change. It draws not only on direct empirical observations, but also refers to secondary data, in particular the local ecological knowledge of the Tai Baan Research conducted by riparian communities. In particular, it attempts to identify key plant communities and species that have importance in terms of socio-economic and cultural reasons, and the extent to which they are dependent on natural flow regimes.

The detailed findings of the Tai Baan Research were particularly useful for reference, as there have been few formal, scientific studies of floodplain vegetation conducted on the Nam Songkhram floodplain, highlighting the importance that more holistic and situated studies such as Tai Baan Research can play in furthering knowledge of wetland ecosystems. This research catalogued 191 species of plant with beneficial uses from the LSRB floodplain wetlands and identified 28 distinct habitats or sub-ecosystems, a system of classification far more detailed than conventional scientific attempts at classification of Mekong wetland habitats have so far managed. The Tai Baan Research sub-divided the overall wetlands ecosystem into four separate sub-categories namely:

- Upper floodplain habitats
- Lower floodplain habitats
- Flat lowland habitats, incl. permanent and temporary water bodies
- Riverine habitats

The seasonally flooded forest (*paa boong paa thaam*) has been previously identified as having most value and significance to local livelihoods, partly due to the variety of useful flora found within it and partly due to the role it plays as a source of fish and aquatic products in the flood season and during the flood recession (Blake and Pitakethepsombut, 2006; Khonchantet, 2007). In a ten village socio-economic study of seasonally flooded forest community use, Khonchantet (2007) estimated that the average contribution of wetland products to villager's income was 38,403 Baht/household/year of which 3.54 %, 18.16 %, 4.21 % and 19.11 % were made up of wild vegetables, edible mushrooms, bamboo shoots and livestock fodder components respectively. However, it is recognized that the seasonally flooded forest is in a much degraded state both quantitatively and qualitatively.

This report, combining wet and dry season data, tries to illuminate the past and present status of the floodplain vegetation to identify some of the linkages between plants and other disciplines, in particular hydrology and landuse. It also considers briefly the impacts that some of the gross ecological changes might have had on the health of the overall ecosystem, including threats from introduced alien species, flow regime changes and land use changes. Lastly, it presents one or two recommendations for further study in the Nam Songkhram Basin.

Methodology

The methodology incorporated two principle tools for field data collection.

1. Forest ecology observation: Walk survey along each site's transect lines and visual scanning of vegetation in the floodplain area were used for plant community sampling.
2. Socio-economic data collection: Using three variables namely direct observation, in-depth individual interviews and informal group discussions with local informants to determine both direct and indirect utilization of the floodplain plant resources.

In addition, the vegetation specialist referred to the knowledge of other team members in building up a composite picture of plant species and vegetation community importance with relation to the wider ecosystem and socio-economics at the sites. Unfamiliar plant specimens collected were checked with villagers for local names, while a few sample specimens were taken back to Mahasarakham University for later scientific identification. This study was only interested in flowering plants, plus some mosses and ferns, and did not bother with algae or phytoplankton.

Results and Discussion

Plant Communities

The Nam Songkhram river floodplain's native vegetation cover would appear to be represented by plant communities that normally grow rapidly in the dry season, followed by a period of slower growth during the wet season flood period in a successional pattern of growth. When the wet season arrives some plant growth activities will stop temporarily or some members of the community will die-off, as they cannot tolerate the prolonged flooding period. An exception to this general pattern is the ubiquitous flood-tolerant bamboo (*Bambusa* spp.), which grows rapidly when the rainy season starts with shoots out-pacing the rising flood water to present greenery year round, even when the floodplain is under 4 – 5 metres depth of water. This remarkable trait of the bamboo plants to both tolerate floods and still send up edible and nutritious shoots well into the dry season, has helped them to being an important component of local livelihoods. Then, as the water level subsides at the start of the dry season the same plant community with some new pioneer members will reinitiate growth. This pattern is called a cyclical succession. The cycle begins with a pioneer phase of seed germination and then moves through several stages sequentially before finally returning to the original state. So, part of the community is impermanent or annual and the rest are flood hardy perennial species that can tolerate up to five months submersion with no ill effects (Utit, 2001). As a result of this successional pattern and habitat diversity, the ecosystem exhibits high plant diversity, structural complexity and resilience.

Plants in the seasonally inundated forest grow under conditions of water excess for part of the year through the wet season. Many plants show flood tolerant characteristics and structures. The structures; root, stem and leave, largely consisted of spongy tissue (aerenchymatous tissue). A few plants produce the erect roots that exposed form underwater, the root system can obtain oxygen in an otherwise anaerobic substrate (pneumatophores). Also, there are dense aerial roots in some plants that grown downward from the branches to the ground. Some have spines on the stem and use biochemical adaptation to produce alcohol dehydrogenase enzyme, in order to resist a water excess situation during periods of prolonged flooding. (Kramer, 1983; Vickery, 1984). In short, plants have adapted and evolved through natural selection to cope with and thrive in the climatic and hydrological extremes of the flood pulse phenomenon, seen in different parts of their life cycle.

As all three of the floodplain sites studied are influenced by river flow in similar ways, they exhibit some common landscape features which are associated with tropical riverine floodplain ecosystems such as the Lower Mekong Basin. These features or habitats are known by local names such as *Kud, Nong, Lerng, Wang and Horm;* and have significance for local livelihood strategies (Tai Baan Research Network of Lower Songkhram Basin, 2005a). When considering the main topographical characteristics of the floodplain area, it was found that there were three distinct zones: **upper floodplain, lower floodplain and alluvial terrace area.** The plant communities tend to be distinctive in each area. A list of local and scientific names of plants identified during the dry season study are given in Annex 8.

Plant community in the upper floodplain area

This area was located along the two sides of the main river channel and spreads out as a green ribbon of vegetation parallel with the river. The width of this belt depends largely on how far soil type, fertility and moisture influence from the main river extends. Agricultural activities by villagers have influenced the extent of remaining forest and only remnant patches of secondary forest are evident nowadays.

The lowest lying areas closest to the river will tend to flood first, with water normally rising slowly and predictably in July and August to cover large swathes of floodplain. Large areas of floodplain where the soils are marginal and infertile take on the appearance of a green meadow after the flood recession and may be classified as a "**herb zone in open land**". The vegetation types found in this area are mainly herb species such as: *Pak Bor* (unknown species), *Praya Mutti* (*Grangea maderaspatana* (L.) Poir.), *Pak Pongpod* (*Polygonum tomentosum* Willd.), plus some sedges and grasses. These groups of plant appear only in the dry season, post-flood recession. They try to complete their life cycle in the dry season period by rapidly maturing and producing abundant flowers and fruits. They leave reproductive parts in the alluvial soil which survive the wet season, when mature plants are largely absent. Flooding plays an important role in seed dispersal and destroys remaining non-flood tolerant plants. The seeds are able to survive tough conditions lying dormant in soils and geminate the following dry season. Another vegetation group present in the same zone are various aquatic plants such as S*arai-hangkaroke* (*Hydrilla verticillata*)*, Deplee Nam* (*Potamogeton malaianus)* and *sarai fai* (*Chara* sp*.*). By contrast, if this area is a more infertile, sandy and shallow soil zone, the vegetation will tend to consist of more open ground dominated by sedges, grasses and a reduced group of aquatic plants. These areas, such as Tung Mon near Ban Tha Bor (Site 2) are important grazing areas for large livestock.

Next, moving towards the edge of the floodplain is a "**strongly embraceable shrub community"** such as spiny shrubs, scandent shrubs and densely crowded root shrubs, mixed with climbers. Each plant competes with members of the same species and other species to occupy limited space by spreading roots and stem on vertical and horizontal planes. If the floodplain has strong flows across it erosion may occur at certain sites, but at the same time there will be sediment deposition occurring at others. When the period of highest water levels are reached, this plant community will become completely inundated and shed its leaves. Hence, these vegetation types have adapted to periods of prolonged water stress. Such community adaptation is important for its own and the wider ecosystem's health, especially for providing habitat to aquatic animals for spawning, nursing juveniles, food source, etc. Vegetation in this zone includes *Nam Kajang* (*unknown species*), *Nam Geow Gai* (unknown species)*, Krai Hangnak* (unknown species)*, Krai Kinak* (unknown species)*, E Nod Nam* (*Ficus heterophylla* L.f.)*, Ben Nam* (*Combretum trifoliatum* Vent.)*, Nam Kae* (*Plecospermum andamanicum* Kimg ex Hook.f.)*, Kreua Hoi Pla* (*Phyllanthus taxodiifolius* Beille), etc. Most of them flower and fruit under non-water stress conditions in the late dry season (i.e. March-April).

In recent decades, these communities in the LSRB, have decreased in extent and become degraded due to logging, charcoal making, agricultural conversion and are either now cultivated or are mixed with large stands of flood-tolerant *Bambusa* spp. (*Pai kasa*), a pioneer species.

Beyond the strongly embraceable shrub community towards the edge of the floodplain is an area dominated by **tree and climber vegetation**. Mainly members consist of various size water stress tolerant trees and climbers. When the highest water level period peaks, some of them are immersed for several days or weeks. Some big trees forming canopies are able to tolerate partial submergance such as *Saeng* (*Xanthophyllum lanceatum* (Miq.) J.J.Sm), *Hwa* (*Syzygium cumini* (L.) Skeels), *Hae* (unknown species)*, Jiknam* (unknown species)*, Madan* (*Garcinia schomburgkiana* Pierre)*, Kumnam* (unknown species), *Kasin* (*Schoutenia ovata* Korth.) and *Krabao* (*Hydnocarpus anthelminthica* Pierre); also immature or small tree species such as *Hu ling* (*Hymenocardia wallichii* Tul.) and others may be immersed for up to several months. To survive, some climbers rapidly climb to the top of large tree canopies that act as supports.

It was observed that several plants use flow as a seed dispersal mechanism. Therefore, before the wet season *Jiknam* (unknown species)*, Maseaw nam* (unknown species)*, Peuai nam* (*Terminaria cambodiana* Gagnep)*, Ma dan* (*Garcinia schomburgkiana* Pierre)*, Kratum nam* (*Mitragyra diversifolia* (Wall. ex. G.Don) Havil.) will flower and fruit abundantly enough to survive an extended flooding period and provide food for various animals such as fishes, birds and insects. The downstream flow will help distribute fruits or seeds far away from the parent tree to allow them to germinate in a suitable new area during the next dry season.

To respire during flooding, some trees and climbers produce aerial roots on their stems such as *Fai Nam* (unknown species) and *Ling-ngo* (*Byttneria echinata* Wall. ex Kurz.). Some species, *Madan* (*Garcinia schomburgkiana* Pierre) and *Ben nam* (*Combretum trifoliatum* Vent.) can produce pneumatophores. Wiry-stemmed climbers are common such as *Kreua Plok Chang* (*Ventilago* sp.). Epiphytes include Orchids, *Dtang* (unknown species), and *Plu* (unknown species). Additionally, various members of the *Zingiber* group, grasses and sedges were also found.

A **tree and climber vegetation** story dominates the mainstream banks, and also along the banks of backwaters, oxbow lakes and ponds. A Ban Tha Bor floodplain oxbow lake, *Kud Huay Sing*, has had its level artificially raised by the construction of a weir near its outlet with the Songkhram River, causing the **herb zone in open land** and the **strongly embraceable shrub community** to be permanently flooded, along with some areas of the **tree and climber vegetations** zone. There is evidence of many woody plants dying back in this area, although this may be aggravated by salts rising to the surface in the artificially elevated watertable.

Plant Community in the Lower Floodplain

Because of slight differences in slope and elevation, it may be observed that there are two separate levels of floodplain apparent; especially around the edges of floodplain water bodies such as ponds, swamps, oxbow lakes, streams, etc. These areas experience prolonged flooding for many months, and become dry season refuges and habitats of numerous aquatic animals, such as fish, amphibians, mollusks, crabs, leeches, insects, water snakes, etc. Mainly the vegetation community consists of various aquatic plants. There are four levels of dominant aquatic plant types, namely

- **marginal plants** such as *Pue* (*Actinoscirpus grossus* (L.f.) Goetgh. & D.A. Simpson), *Lai* (unknown species), *Toop Ruesri* (unknown species);
- **rooted emergent plants** such as *Bua Sai* (*Nymphaea lotus* L.), *Bua Luang* (*Nelummbo nucifera* Gaertn.), *Krajab Sikhow* (*Trapa natans* var. *pumula* Nakano), *Paengpuay Nam* (*Ludwigia adscendens* (L.) Hara), *Talapat Ruesie* (unknown species), *Paktop Thai* (unknown species);
- **floating plants** such as *Jok* (*Pistia stratiotes* L.), *Jok Hunu* (*Salvinia cucullata* Roxb. ex Bory), *Paktop Chawa* (*Eichhornia crassipes* (Mart.) Solms-Laub.);
- **submerged plants** such as *Salai Hangkarok* (*Hydrilla verticillata* Presl**.**), *Salai Khownieow* (unknown species), *Pobpeb* (unknown species), *Sarai Yaa* (unknown species).

Every year fluctuating flood levels affects the river ecosystem with respect to changing aquatic animal abundance and aquatic plant populations. Especially with floating plants such as *Jok* (*Pistia stratiotes* L.), *Jok Huunuu* (*Salvinia cucullata* Roxb. ex Bory), *Paktop Chawa* (*Eichhornia crassipes* (Mart.) Solms-Laub.), flow can flush such plants out from backwaters into the main river. Thus, there tends to be little floating plant accumulation like in other river systems, which would cause the water sources to become shallower. Thus, if there were no regular overtopping floodplain floods each year, marginal plants would tend to become the dominant plant group due to progressive shallowing of backwater features. The water area would be reduced, followed by the strongly embraceable shrub community gradually occupying the margins. Eventually, this area would become a floodplain area without significant permanent water features and many kinds of aquatic organisms would be lost from the ecosystem.

3.5 Socio-Economic Study

Dr Buapan Promphakping

Methodology

An important aspect of the Intermediate E-flows Assessment was that the study team comprised specialists from different disciplines, resulting in the combined methodological approach to the assessment being quite complex. Part of the socio-economist’s role was to try and understand the other disciplinary approaches and “add value” to them by looking for socio-economically relevant data within their work. In theory, the team planned that each member should share not only the data obtained, but also justification of the methodology employed to obtain the data. In practice though, the limited time available made full participation in all the other’s approaches a challenge.

It was presumed that the villagers of the selected villages would be the main users of the riparian resources, but often there could be other outside groups who utilize that section of river or resources. However, the assumption was sufficiently valid to allow analysis of socio-economic change, linking floodplain resources, various stakeholders and resource use aspects of the wetlands in question. Additionally, the dry season study allowed a more thorough exploration of linkages between socio-economic aspects and biological aspects within the given ecological setting.

In the wet season, socio-economic data was primarily obtained through interviews with local leaders. In the dry season by comparison, the teams decided to employ a range of methods and tools that are commonly used in participatory field studies, i.e. group interviews, focus group discussions, historic time-line, transect walk and institutional analysis. These tools or methods were usually used in combination during evening village meetings. It shall be noted here that Venn diagrams which was originally planned to be used for institutional analysis, was found to present difficulties in application.

Assessment

Socio-economic changes in the community and changes in floodplain resources

The study of three communities revealed that socio-economic aspects of the Nam Songkhram River Basin rural society were formerly characterized by a largely subsistence-based local economy that started to be commoditized in the 1960's. The economy of Ban Kam Chi (Site 1) several decades ago was largely dominated by NTFP harvesting, upland cash crop cultivation (including kenaf, sugar cane, cassava) combined with subsistence rice production.

The majority of local people are in-migrants from other provinces of the Northeast, who were enticed by the prospects of cheap and available forest land to grow cash crops. When the uplands were fully claimed, new migrants extended their land holdings into the floodplain lands, with the assistance of local leaders of the time. However, as these lands were flooded annually for several months and were seen as having poor prospects for cash crops, the lands were mostly saved from total clearance and remained as secondary forest, useful for common pool resource fishing, hunting and gathering activities.

Ban Tha Bor (Site 2) was formerly dominated by a 'fishing-based economy' (Wallipadom, 1998) and was considered an important centre for fish product trading due to a seasonal abundance of fish locally, which allowed the majority of population in Ban Tha Bor to make a significant part of their living from fishing or fish processing. All the surrounding villages of the Lower Songkhram River Basin ate fish on a daily basis (often three times daily) and fish and aquatic resources formed (and still form for many households) the bulk of protein consumption. Ban Na Pho (Site 3) could be considered more of a "subsistence community", where households formerly mostly depended on a mix of fishing, NTFP extraction, upland cash crop growing and subsistence rice growing for their livelihoods.

Over the past 25 years, a number of changes related to degradation of floodplain resources were observed or reported to the researchers. First, there was massive forest clearance in the village peripheries, both on the floodplain and on upland terraces. Ban Kam Chi villagers reported that a private company obtained a logging concession from the state during the second half of 1970s. Big hardwood trees were cut and removed from the village within a period of only two to three years. In Ban Na Pho the villagers said that there had been no concessions given to private companies, but the villagers themselves cut valuable timber trees along Nam Oon river banks and floated them down to sell to sawmills or local businessmen at Sri Songkhram township. The rate of removal of logs and tree stumps from the riverbanks and surrounding floodplain, which had previously provided varied habitat for fish, increased as the price of hardwood increased.

Second, dry season rice growing has rapidly expanded, primarily into floodplain areas. This has been happening in conjunction with construction of water infrastructure on the floodplain. In Ban Kham Chi an earthen dam was built in the 1980s at the mouth of Huay Chi, a small natural stream flowing into the Songkhram River, to provide gravity-fed irrigation to a small area (< 50 rai) of land downstream. Different types of water sources were found in Ban Tha Bor and Ban Na Pho, all of which were located on floodplain areas. In the rainy season these water storage bodies are inundated by floodwaters. The justification given for building these water resources was to store water for dry season rice growing, although we found many not able to fulfill this function. Although these water sources are frequently under-utilized, plans to build more water resources by both local and central government agencies abound. These plans are usually driven by claims of drought and water shortage for dry season rice farmers.

Third, the economy of the three communities over the past three decades has been primarily dependent on external income sources and factors. Out-migration is found to be common across the three communities, reversing the earlier trend of in-migration. In Ban Kham Chi the leaders reported that more than 200 people currently work outside the village as laborers, representing almost fifty percent of the village population. Every week or two, several pick-up trucks ferry people, food and necessities from the village to and from industrial towns in central Thailand. On the return trip to the village, the pick-up truck owner will bring remittances from the workers to their families. Significant numbers of workers from Ban Na Pho and Ban Tha Bor migrated overseas in the last 30 years (e.g. Saudi Arabia, Singapore, Taiwan, Brunei), stimulating the local economy in the form of houses, vehicles and consumer items, but precipitating wider socio-economic changes. Mobility and consumption patterns in rural villages now more closely reflect the wider socio-economic patterns of urban Thailand than in years gone by.

It should be noted that the growing importance of the external economy and out-migration in these villages has likely eased some pressure on the floodplain resources, i.e. fish and non-timber forest products (NTFP's). However, from our observations the use of floodplain resources still remains high, partly due to the fact that fish and NTFP's have been further commoditised. These resources are not only used to satisfy basic household food needs, but have increasingly become a source of income for many households. This coupled with a growing demand for wild products by urban markets and an almost complete switch to a cash economy, has intensified use of floodplain resources. This includes the issue of land tenure, which will be discussed further.

Fourth, is the widespread presence of agribusiness in the Lower Songkhram River Basin and its occupation of vast areas of floodplain land. In Ban Tha Bor, villagers reported that the SunTech Company Ltd dishonestly obtained former publically-owned wetlands by conspiring with local state officials. Later, the company approached the villagers and offered them a sum of money in exchange for the land rights. The majority of villagers accepted this offer, although official documentation of this land had not yet been undertaken.

In Ban Na Pho, villagers were also approached and were offered similar kinds of benefits, although in their case the villagers did not accept the offer of the company. The company completely cleared the lands it had acquired to grow intensive vegetable crops to supply a factory located in Ban Don Daeng, Sri Songkhram District (close to Site 2). For a while in the late 1980s and early 1990s, many local villagers were employed in the factory or in the plantations growing tomatoes or sweetcorn for tinning. They reported the heavy use of pesticides and chemical fertilizer, as well as constant conflicts between villagers and the company about land ownership and right of access, for example to fish or raise livestock on the floodplain.

Given that the land obtained by SunTech is located in the heart of the LSRB floodplains, clearing the land for growing intensive crops has inevitably created detrimental impacts on floodplain resources. Although the cultivation activities of the company have steadily declined in the past ten years (apparently due to poor competitiveness in tinned tomatoes for export), until the reported 2007 abandonment of plantations and all production staff laid-off. Neverthess, the land still remains under the control of Sun Tech Company, despite it currently lying idle for agriculture. The company's long-term intentions for the land are uncertain, but local villagers are suspicious it has plans to capitalize on its extensive assets, possibly by demanding state compensation for lost land, should a large reservoir be built on the Nam Oon or Nam Songkhram floodplain, as currently proposed by the Royal Irrigation Department.

Invasion of a new tree species: Eucalyptus

The changes in socio-economic conditions described above meant that labor for agricultural work in the local community became scarce over time. At the same time, remittances from outside often do not meet a family's financial needs and agricultural activities continue, especially for rice cultivation. Increasingly villagers have chosen agricultural activities, techniques or crops with low labor requirements, including non-food cash crops such as eucalyptus and rubber plantations.

The boom of eucalyptus cultivation in all three villages has been quite a recent phenomenon, although it has actually been promoted locally for more than two decades. The promotion of this alien species tree crop has been controversial, especially the issue of environmental impacts. In Ban Kam Chi, villagers learnt about the economic prospects of eucalyptus from an early adopter who made a sum of money higher than other legally crops grown previously. Eucalyptus cultivation has been promoted by both state agencies and the pulp and paper industry, with one major mill being located near Khon Kaen, but logs also being sent to central Thailand mills for processing.

The price of eucalyptus varies, but in mid-2007 was in the region of 900 to 1,100 baht per tonne (i.e. approx $25 - $30/tonne). Furthermore, eucalyptus has been widely adopted for the specific reason that it can tolerate flooding better than most other crops and so is considered suitable for growing on the Songkhram floodplain. Moreover, growing eucalyptus requires minimal labor input after planting. In the 2007 dry season study, we observed vast areas in Ban Na Pho had recently been cleared since the recession of the last flood. According to one study in Ban Tha Bor, more than 40 percent of the households grow eucalyptus, with plantations on the floodplain (Srisuno, 2006).

Institutional dimensions[11]

a) Land and property rights

Beginning from the broad topic of floodplain resources (forest, land, water, fishery, etc.) governance, one of the primary considerations is property rights regimes and their evolution over time. In the recent past wetland forests, floodplain land and the river itself were considered as open access resources by local people. The abundance of these resources and their mostly subsistence-level use meant that limitations on resource use was considered unnecessary. Scarcity and over-harvesting of these resources were not an issue in the minds of villagers. Although there were cultural practices constraining some use of natural resources, as mentioned earlier, these were mainly to protect social cohesion, rather than the natural resources.

Changes in the property right regimes governing the use of floodplain resources have been primarily driven by socio-economic changes. First, in Ban Kham Chi migration into the village during the 1960s resulted in a growing scarcity of upper terrace land and wild natural resources such as timber trees and wildlife. Consequently, occupation of land gradually expanded downslope onto riverine floodplains. This was done through local (formal) leaders – previous village headman and *kamnan* (Sub-District chiefs). Reasoning that villagers had insufficient land for cultivation, the lands were allotted to households that conspired with the leaders. Then portions of lands were sold to new migrants, without formal or legal documentation. Later on, land officials were called on to endorse the property rights of some of these people by issuing temporary land documents named *Sor Por Kor*[12]. This appeared to be an attempt at avoiding later problems that may have arisen from denying land rights that had been given by local leaders.

Similar processes also occurred in Ban Tha Bor and Ban Naa Pho, but the privatization of land was advanced by an agribusiness company in the case of the former village. As mentioned above, the agribusiness company conspiring with local authorities, issued land documents to households in Ban Tha Bor. Households were not aware that they ever officially “owned” a particular piece or pieces of land on the floodplain, yet were persuaded by company agents in collusion with local officials into signing a document to transfer the land to the company in exchange for some money. Villagers of Ban Naa Pho turned down a similar offer, apparently for the reason that the price offered by the company seemed too low in their view. Although the process of land documentation for floodplain land claims has not yet been officially completed, the trend of common land privatization has continued. Agribusiness companies hold vast tracts of land, while villagers claim rights on smaller plots of surrounding lands, with disputes common.

It should be noted here that in the LSRB, the state has widely issued *Sor Por Kor* documents to villagers. This was justified principally as an attempt to solve the problem of ‘having no farmland to earn a living’ – *banha mai mee teedin tee tam gin* – but in the case of the Nam Songkhram floodplain, ironically, most plots were left unused for agriculture until recently because of annual flooding rendering them unsuitable for wet season rice. At the same time, lack of irrigation infrastructure and extension support left them unsuitable for dry season rice, despite several failed attempts. Additionally, the state has over the past few years introduced a compensation scheme for farmers who are affected by natural disasters. Flooding is regarded as a “natural disaster” (*utokapai*) no matter its actual causes, but in order to claim compensation the villagers must grow rice on the floodplain land they own, despite knowing the high probability that the crop will be damaged or destroyed by flood. The compensation is based on the area of land they use for growing rice; hence the greater area

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[11] A summary of the institutional analysis is given in Annex 7.

[12] *Sor Por Kor* is a category of land document issued in lands administered under the Office of Agricultural Land Reform (ALRO), under the Ministry of Agriculture and Cooperatives.

reported as cultivated, the more compensation can be claimed. Claims to land rights by villagers has also been stimulated by the current state policy of '*turning property into financial capital*'. The state stipulated that *Sor Por Kor* land title would be acceptable documents for guaranteeing loans from state and commercial banks, reversing past loan condition practices. This policy has encouraged people to clear naturally vegetated floodplain land. Villagers in all three villages told us that the floodplains have been subject to rapid occupation since the policy was announced, leaving very little common land left unclaimed. The privatization of land is closely associated with the depletion of floodplain resources, especially the clearance of land to grow eucalyptus, as described above.

b) Community institutions

In general, there is scarce evidence for an active role by community institutions pertaining to floodplain resources. From interviews, beliefs in supernatural forces related to floodplain resources used to exist but have evidently weakened or virtually disappeared. In Ban Kham Chi, the villagers reported that there was a belief in a local guardian spirit known as *Ta Poo* of Kham Chi (ancestral spirit of a natural spring on a Songkhram tributary which gave the village its name). This belief stipulated that the use of natural resources, especially fish, must be conducted in a particular way. Villagers said that anyone who killed a *pla faa* (a freshwater turtle) would die. Some years ago a villager killed a crocodile and as a consequence almost ten persons in the village later died, according to local beliefs. This village has a strict control of migrants from outside into the village for the reason that new migrants may find it hard to comply with local beliefs. However, the belief in *Ta Poo* of Kham Chi has declined with the former spirit house for *Ta Poo* being moved from its old site by the stream to a new site located near the village, apparently for convenience-sake.

In Ban Tha Bor, the temple has played a lead role in demarcating and managing a 'sanctuary compound' (*khet apai than*), – an area prohibiting all forms of killing and hunting. This includes a protected area located in the main channel of the Nam Songkhram River in front of the temple prohibiting all fishing. A semi-protected 'Community Forest' area is located along the Huay Sing stream of Ban Tha Bor which villagers co-manage and have recently started some reforestation activity. But these areas are relatively small compared with the overall size of the critical floodplain area.

One important institutional aspect involves the rules and regulations of the community pertaining to water bodies. It was noted that the implementation and actions of these institutions varies considerably. Most villagers expressed a view that the main channel of the river is regarded as being open access to all, thus limiting the community on placing fishing restrictions. However, for Ban Tha Bor and nearby villages, the main river channel has been divided into unmarked sections, each under the guardianship of a particular village. The actions of each community to limit use of the river, especially control of the use of different types of fishing gear was generally unclear. More manifest were regulations concerned with natural swamps, reservoirs and other types of small waterbody connected to the main river. These water sources are located on the floodplain and will be inundated during floods. In Ban Tha Bor, villagers reported that the right to fish in some of these water resources will be auctioned off in a bidding process to a private concession for a certain period of the year (during flood recession and the early dry season), and income from these concessions will be used for public projects of the village, such as small infrastructure projects or a fund for emergency repairs.

c) State agencies and local government

Actions of state agencies may either limit or encourage use of floodplain resources. From a focus group discussion in Ban Naa Pho, the government agencies concerned with floodplain resources include the former Department of Energy Development and Promotion (DEDP), Department of Land Development, Royal Irrigation Department (RID), Department of Land Registration, Tambon Administrative Organization (TAO) and Provincial Administrative Organization (PAO). These state agencies tend to implement projects using their own budget and expertise usually engaging in minimal consultation with local people, except for local government agencies. Most of the projects of the state agencies are related to water infrastructure development, particularly irrigation. These currently include a plan by the Royal Irrigation Department (RID) to build dam barriers near the confluence of the Nam Oon and Nam Songkhram rivers, which would flood significant areas of floodplain land affecting sites 2 and 3. While villagers are still unclear which areas of land will be flooded, some have given cautious support to the Nam Oon project on advice of village leaders. Villagers also ranked the importance of these agencies according to their role in water infrastructure construction.

d) Community Organization and Environmental Associations

There are several kinds of community organizations existing in the villages. These organizations were both initiated and funded by state and non-state organizations. There are farmer associations, occupational groups, women's groups, credit groups (e.g. One Million Baht Village Fund scheme of the Thaksin government), child care groups, etc. However, none of these play a direct role related to governing the use of floodplain resources. An exception might be a community organization in Ban Tha Bor, where an NGO is presently working with the villagers. The community organizations are managing community forestry, village (temple) sanctuaries, and coordinating with NGO's (and state agencies), in studying floodplain resources and initiating activities that may lead to the wise use of floodplain resources.

One interesting point of information to emerge from a focus group discussion in Ban Naa Pho was that an environmental association had been formed. From the report of one participant, the group was formed based on the TAO structure. Volunteers working for the association recruit from the members of the TAO. But the role of this association is somewhat suspicious; this association might be used to mobilize people to support the dam construction that is currently planned for construction near the mouth of Nam Oon, but would create a reservoir backing up far along the floodplain past Ban Pho Noi. Another local association is the Natural Resources Conservation Club of the Songkhram River Basin, whose Chairman is the village headman of Ban Pak Oon (nearby Ban Tha Bor).

Resource user groups

The socio-economic analysis from both the wet and dry seasons suggests that floodplain resources have become less important as the economy of these communities has been gradually oriented towards the outside market. However, these resources still remain relatively important to certain groups, which will be discussed below.

a) Fisheries

Fishing is far more important to local livelihoods in Ban Tha Bor than the other two villages. This is primarily due to the bio-physical location of the village; a) Ban Tha Bor is located in 'the heart' of the floodplain – where the floodplain extends to its widest point in the LSRB; and b) there are relatively fewer options for agriculture due to lack of raised terraces nearby. This wetland location has meant that fish have always been abundant and local people have long been highly dependent on fishing and fish processing for a living. Although people have been increasingly earning a living from employment outside the village in recent decades, fishing continues to play an important role for the household economy of many families. One leader of the village told us that over eighty percent of the households in Ban Tha Bor still go fishing, but the extent to which fishing contributes to the total household economy has declined. By comparison fishing in the other two villages is far less important and has declined as a main form of livelihood and tends to be regarded as a 'supplementary' activity for most villagers.

In Ban Kham Chi, the 'master' (*praan or sian*) of fishing is a man from a relatively well-off household. The household owns a grocery shop, primarily run by his wife. The household has only one sibling (adopted) age 30 years old who primarily takes responsiblity for agricultural work in the household. In contrast, a poor household interviewed in Ban Kham Chi, earned a living from out-migration to Bangkok as construction workers. Upon the birth of a son in the city, the family returned home to the village and attempted to earn their living locally, including fishing and rice farming. However, due to a scarcity of fish and lack of fishing skills, it was very difficult for this household to sustain a reasonable standard of living, they claimed. The young husband despite suffering from poor health, now plans to migrate out the village again in search of work.

In Ban Tha Bor where fishing is of greater importance than other two sites, the stakeholders in fishing seem to be divided according to the fishing gears they use. In observing a fishing operation using a beach seine net in Huay Sing and subsequent discussions with local leaders, villagers expressed their concern about the depletion of fish caused by the improper use of fishing gears. Wealthier fishers tend to own big (often illegal) fishing gears and can catch large amounts of fish in certain seasons, whereas poorer fishers tend to own small fishing gears, and can catch only relatively small quantities of fish for subsistence. Using big fishing gear does not only deplete fish stocks, but may also destroy fish habitats (such as the removal of logs, branches of trees in the water for beach seine operations). The depletion of fish stocks will particularly cause negative impacts on small fishing households whose household economy is often more dependent on fishing than wealthier fisher households who often have the financial security to have diversified into other economic activities.

b) Non-timber forest product (NTFP) collectors

Villagers of the three villages identified several NTFP's available in the floodplain that are frequently gathered. Bamboo shoots and several kinds of wild vegetables were ranked highly, usually second only to fish. Villagers use these resources for domestic consumption mostly, with few households in the three villages reported earning income from NTFP's. However, collection of these resources requires labor and the availability of NTFP's varies greatly according to season. As discussed earlier, the cash economy has come to dominate the community economy, therefore villagers will give priority to labor activities that can earn cash in hand more than activities with less certainty about a return. Moreover, wild vegetables and fish are widely available in local markets. Most bamboo shoots and wild vegetable collectors are women. From the focus group discussion, although women reported that occasionally they collect NTFP's from the floodplain, it appears that household dependence on these resources has declined over time. Two main reasons for this are, as stated above, that they prefer to undertake activities that can earn cash and alternative fresh foods are available in local markets or even sold by traders to the village from the back of pick-up trucks. However, it was noted that older villagers firmly preferred the taste of wild vegetables and natural foods to the less fresh and "pesticide laced" cultivated vegetables found in the markets.

c) Rice farmers

Most of the villagers in three villages are part-time rice farmers, although not all of them grow rice on the floodplain. In Ban Kham Chi a portion of households own land in the upper terrace land (i.e. not flooded), but have long utilized lowland areas for limited rice cultivation. Some households take the risk of growing rice as flood levels each year are unpredictable. In years that floods are limited or brief their rice crop will be secure, while the upland rice crop may suffer from insufficient rainfall. By contrast, in years that floods are high, rice crops on the floodplain will be inundated and damaged / destroyed, while the upland crop will be secure. In the past occupation of land to grow rice and other crops on the floodplain was minimal, compared with the vast areas of floodplain forest land undisturbed by villagers. In Ban Tha Bor where almost the whole surrounding land surface is inundated each rainy season for a few months (leaving the village as a virtual island), villagers relied on fish products to exchange with rice, whether in the form of barter exchange or through cash sales.

Over the past two decades, dry season rice farming has been heavily promoted by the state. This has occurred alongside widespread construction of water infrastructure, especially the construction of weirs, reservoirs, embankments and dredging of streams and channels by the state agencies. The justification for this construction was primarily given as supplying water for rice growers in the dry season. Many of these structures were observed as discrete waterbodies on the floodplain in the dry season study, whereas during the wet season they were inundated and became part of a massive shallow lake. Clearly, the modification of the floodplain has affected the floodplain natural resources. National agricultural development policy stimulated villagers to clear floodplain forests to grow rice. However, dry season rice cultivation has not expanded to the same extent as the proliferation of water storage structures, chiefly because of the flat topography of the area which dictates that a small dam will create a large reservoir. In Ban Kham Chi, a weir built from about twenty years ago has obstructed a small stream connected to the Songkram River to create a reservoir. But less than ten households were reported growing dry rice in 2006/07, planting an area less than that lost to the reservoir. A growing number of households were found to be growing dry season rice in Ban Tha Bor and Ban Naa Pho, partly encouraged by a good market price for glutinous rice in the past year. In fact we observed from the dry season study that in Ban Naa Pho only one family used water for growing rice from the reservoir built by the Department of Land Development over the past few years, while the entire fields adjacent to the water source were left idle, probably due to the costs of pumping water to the fields. Village irrigation projects are always subsidized by one state agency or another and frequently last only as long as the input subsidy lasts.

Despite this, building water infrastructure remains the top priority of the local government, particularly the Tambon Administrative Organization (TAO). In talking with the Chairman of the TAO at Ban Na Pho, he told the team that people in the vicinity are demanding the TAO to build more water infrastructure for rice growing. The plan of TAO to build new water infrastructure includes constructing a weir on the Nam Oon main channel. From a focus group discussion in Ban Naa Pho, the views of villagers about water infrastructure construction were consistent with that of the TAO Chairman. Pressure and demand for building water infrastructure is high, despite the poor management and usage of existing structures and as long as central policies do not change, it is expected that this will remain the case in the future.

It should be noted here that there was in the past a traditional system of dry season rice cultivation (*naa saeng*) adopted by local people in the LSRB. Rice growing followed the flood recession by planting along floodplain channels and streams, which did not require irrigation infrastructure as natural moisture was utilised. In Ban Tha Bor we also observed an adaptation of this system of rice growing during the dry season study. Villagers grew *naa saeng* on a narrow strip at the edge of the Huay Sing reservoir. Where villagers themselves had built a reservoir (using state funds), it was found that the water management efficiency was better than those systems built by external state agencies (Prompakping et al, 2005). It was also found that there is an alarming number of abandoned water management infrastructure scattered around the LSRB, with little accountability for the failure.

d) **Eucalyptus growers**

The factors driving eucalyptus plantation rapid spread across the Basin have been briefly discussed above, but just a few further points should be mentioned from a stakeholder perspective. Eucalyptus cultivation in the three villages has been primarily driven by the demands of the pulp and paper industry, through local agents, including state officials. The strategy of the pulp and paper industry is slightly different from intensive cash crop agribusinesses in the LSRB in the past in that it does not seek to obtain land and grow the trees on its own land. Instead, the businesses involved aim to promote small farmers to produce raw material for supplying the industry, thus reducing risks and overhead costs associated with land acquisition. The rapidly growing number of farmers growing eucalyptus means a stable source of supply to the factories for several years to come, plus a lower price of raw material. Villagers constrained by labor shortages and looking for a low maintenance crop with a seemingly strong demand and attractive price, have been lured to invest their land, time and money in planting eucalyptus seedlings costing less than one baht per seedling. A parallel cottage business has sprung up in some villages (e.g. Ban Kham Chi) propagating and nursing eucalyptus seedlings to meet the local demand, with households involved claiming they could earn quite reasonable supplementary income from eucalyptus seedling sales. The popularity of eucalyptus was such that in Ban Tha Bor, a forest temple had grubbed out mixed species native trees planted through MWBP assistance the year before and planted eucalyptus seedlings in their place, while in Ban Kham Chi villagers were ripping out bamboo clumps behind their houses to plant eucalyptus stands.

e) Agro-industry

Agro-industry appeared in the LSRB about three decades ago, by obtaining large plots of land on the floodplain from local villagers that had formerly been public land. The industry initially concentrated on growing intensive vegetable crops (e.g. tomato, sweetcorn) for supplying factories for export from their own farms, but later also promoted the growing of the same crops by local farmers. Agribusiness at one time was a significant source of employment for local labor in Sri Songkhram District, as the farm, processing factory and contract farming were creating jobs about 15 years ago when the business peaked. Villagers recounted how initial dreams of a better life working in the tomato processing factory or company plantations subsequently vanished as the company started laying people off en masse. Meanwhile, local farmers who tried growing tomatoes under contract to Sun Tech company often found the price offered was not sufficient to cover their investments and many made losses or were cheated by middlemen over payments.

Due to a mix of financial irregularities involving land acquisition, political interference, non-performing loans and poor competitiveness against foreign producers and macro-economic changes, the agro-industry has declined considerably in the last decade, until now the former tomato processing factory and intensive plantations near Ban Tha Bor have closed down entirely. The fact remains though that this one agribusiness company holds vast plots of land on the Nam Songkhram and Nam Oon floodplains and would still appear to be active in pushing for water infrastructure projects that would provide it with compensation for lost land, thus recapitalizing its loans from various banks.

f) Cattle and buffalo raisers

Cattle and water buffalo are commonly found in all three villages and traditionally formed an important part of the local economy. The raising of buffalo and cattle has long been dependent on the open access floodplain forests and scrub/grasslands for animal grazing and forage resources. As a result of the plentiful common land available for grazing, local villagers made a significant part of their living from livestock and were able to raise large herds in the past. In the dry season the animals would graze on the floodplain, but during the flood season animals would be moved to higher land around the village or on elevated alluvial terrace "islands" called "*Don*" above the water level. During the past few years with the promotion of dry season rice growing and expansion of eucalyptus plantations, grazing animals on former public land has faced increasing difficulties as the common access lands are privatized and fenced off. This has increased conflicts at the village level between livestock owners and crop growers, especially if the animals damage the crops where they once were able to freely graze. The onus is on the livestock owner to keep their animals out of plantations and in Ban Tha Bor, some villagers have been obliged to lower their herd size considerably or even give up raising livestock, because of the problems and disputes arising.

Conclusions: Re-negotiating for the future

Changes in socio-economics of the three villages and the Nam Songkhram Basin in general are quite evident. These changes evidently affect the ecological regime of the river and floodplain. One thing which is clear to the villagers, from focus group discussions and multiple interviews, that the future of the remaining *paa bung paa thaam* or floodplain forest is not bright, due to many pressures. Some even believe that no tracts of wetland forests in the Songkram River will remain in the future. This scenario is not impossible, especially considering that the stakeholders using floodplain resources have extended beyond the local people living in the Nam Songkhram Basin, to include distant agribusiness and the pulp industry, with little vested interest in conserving resources beyond its own narrow needs.

Meanwhile, as resources have declined, local communities have gained higher mobility, higher consumption patterns and no longer rely on natural resources to the same degree as in the past were prominent findings from the study. People in the Songkhram Basin earn their living more and more from distant locations (out-migration), but in the meantime others increase exploitation of the resources of the floodplain through unsustainable usage patterns, in order to meet increased demands from local and distant markets. In the short run there may be growing affluence of the communities, more infrastructure construction, higher consumption patterns and a higher standard of living. But on the other hand, we also can forecast the continued erosion or even total collapse of the ecological regime.

The expansion of eucalyptus has resulted in the widespread loss of *paa bung paa thaam* (seasonally flooded forest). The apparently devastating impacts on floodplain resources was described by one member of the study team as a '*war on ecological systems*'; by replacing diverse native plant species by a single alien species in a fragile environment with as yet unknown long term consequences. This type of 'war' is caused by fundamental changes in national and regional socio-economics, plus altering values of human society; where convenience, mobility and mass consumption have became key desires of rural communities, as well as urban society.

This suggests that the concept of 'environmental flows' is rather complex. Hence, the concept of "Environmental Flows" should perhaps not only be viewed from an eco-hydrological perspective, but from a wider angle of looking at other types of flows across boundaries or systems. Flows into floodplain communities include consumer goods, money, information, novel (labor-saving) technologies such as new crop types, pesticides, insecticides, etc. Flows out from the communities and the floodplains include human labor, natural wetland products (fish, bamboo shoots, mushrooms, etc.), cash crops (e.g. rice, eucalyptus, etc) and soil nutrients (both by erosion and within the crop itself). In fact, the first stages of the ecocidal war occurred about forty years ago when logging concessions were given to private companies and old, valuable hardwood trees were removed. The bamboo-dominated *paa boong paa thaam* is not a pristine, original forest type, but is a sign of a degraded ecosystem in a recovery phase. But the advent of eucalyptus plantations will have far more severe impacts on floodplain ecology as biodiversity of the floodplain vegetation is narrowed to a single dominant type of plant, nutrients are stripped from the soils and food webs are broken.

The future we portray here is under continual negotiation between several stakeholders with interests in the Nam Songkram Basin. But as discussed, some stakeholders hold stronger leverage than others i.e., those who are supported by dominant state agencies and the market in particular. Indeed, the depletion of environmental resources may temporarily increase the affluence of the population in the Songkhram Basin as a result of perverse subsidies distorting the market, even as the larger share of natural capital or wealth of the area is transferred to the brokers of the state (e.g. construction companies or officials), agro-industry, the pulp and paper industry, etc. More importantly, the riverine environment in its entirety has hitherto been regarded as a 'resource' to be exploited in order to achieve notions of prosperity, but never counted as a legitimate 'stakeholder' or partner in itself, that requires certain minimum levels or/and types of flows to maintain it. The livelihoods and socio-economic health of the population of the Nam Songkhram River in the long run is in jeopardy, unless new paradigms of development are adopted. It is therefore necessary to re-negotiate power relations and natural resource use regimes for the 'common future' of all stakeholders.

Height

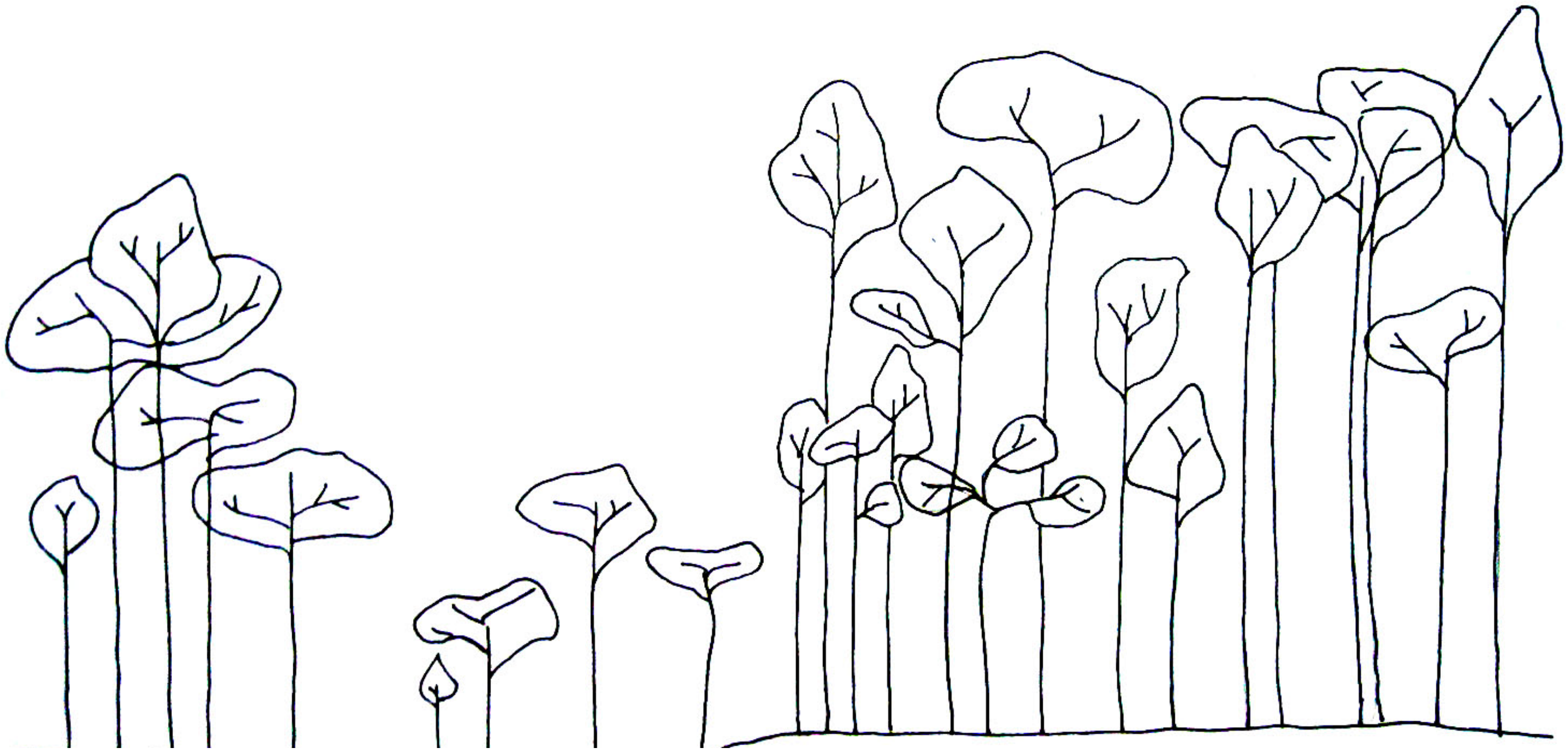


Figure 3.5.1. Profile diagram of ecotone of plant community in upper flood plain area and higher terrace areas
(a) the end of plant community in flood plain area
(b) ecotone; small trees, e.g *Micocos tomentosa, Hymenocardia wallichii, Phyllanthus polyphyllus*
© Dipterocarp stand; *Dipterocarpus alatus*(d) substand; e.g. *Canarium subulatum, Aporosa villosa, Careya sphaerica*
(e) Dipterocarp stand; *Dipterocarpus obtusifolius* (f) plant community in higher area

Plant Community in the lower alluvial terrace area

The alluvial terrace area is usually found as a continuum from the floodplain plant community that is the furthest away from the main river channel. For example, in the Ban Kham Chi site next to a *Bambusa* sp. zone mixed with **tree and climber vegetations** zone is an area of typical lower terrace vegetation. Since land has been highly developed and altered by a community link road which acts as a significant barrier to water flow during floods between the floodplain forest and lower terrace vegetation.

Terraced land also was found on the island (*Don Awm Gaew*) that is encircled by Huay Sing stream at Ban Tha Bor. At Ban Tha Bor site there are many scattered areas of elevated terraces bordering the floodplain zone. On the island, a higher area vegetation zone is found in the centre that is located further away from the water source and slightly above the water table.

During high floodwater levels in the wet season, the zone might be flooded temporarily for a period of a couple days to a week. Almost all of the natural vegetation consists of either Dipterocarp species or other economically valuable tree species. The stands tend to be dominated by uniform deciduous trees, such as *Yang Na* (*Dipterocarpus alatus* Roxb.) and *Yang Heang* (unknown species) and a groundcover of herbs and grasses in some areas. The occurrence of climbers such as *Pi Puan* (*Uvaria pierrei* Finet & Gagnep) and *Khreua Khueang* (unknown species) was also noted.

In terms of aquatic animal abundance, the zone is less valuable for villagers during the dry season, but it represents a zone of high value for villagers in terms of collecting terrestrial edible plants, edible insects, wild mushrooms, resin and honey.

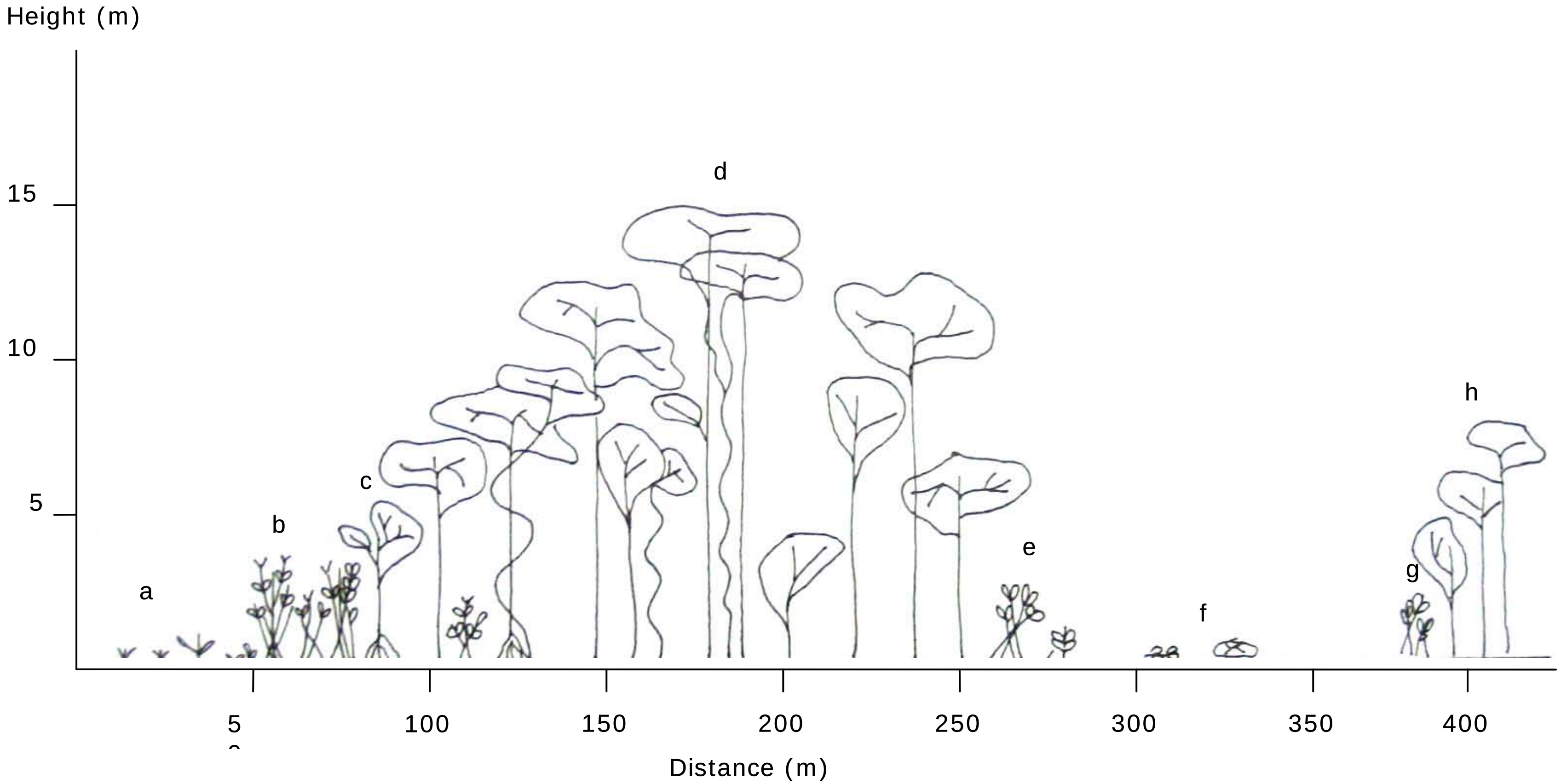


Figure 3.5.2 Profile diagram of plant community in lower floodplain area e.g. near an oxbow lake
(a) herb zone in open land (b,e, and g) strongly embraceable shrub community
(c,h) small trees; e.g. *Hymenocardia wallichii*, *Phyllanthus reticulates* (d) tree and climber vegetation
(f) oxbow lake; aquatic plant zone

Useful plants found in seasonally inundated forest

Many plants are commonly utilized in the seasonally inundated forest for a variety of purposes including fuelwood, agricultural tools, house construction, weaving, material dyes, fishing gear, fodder for livestock, medicine, spiritual/religious ceremonies and the most significant category is edible plants. According to observations by the survey team, the most common group who collect edible plants from the seasonally inundated forest are women (especially fishermen's wives), followed by men and children. They primarily collect the plants for consumption, but occasionally for sale also. Some plants are used frequently, so they have been transplanted to home vegetable gardens for cultivation. The main period for collecting wild plants is the dry season, but the beginning and end of the rainy season as water levels rise and fall are also important periods. Bamboo shoots can be collected nearly all year, with the exception of January to April, when growth slows or stops altogether. The edible plant *Kai Hangnak* (unknown species) can be collected year round. Fodder for livestock is mainly grasses and some herbs. The villagers also collect many edible species of mushroom in the seasonally inundated forest, including *Hed Peung Tam* (unknown species) and *Hed Khone* (unknown species).

There are several floodplain areas alongside the Songkhram river which have extensive stands of a bamboo species (*Pai Kasa).* It is a resilient and successful competitor for available space and soil nutrients and can withstand heavy disturbance*. Pai Kasa* became the dominant over-story vegetation species across many areas following forest clearance, providing a useful and nutritious wetland product for villagers. Twenty years ago land was opened for rice cultivation but the early attempts were often unsuccessful, leading to abandonment and allowing *Pai Kasa* to naturally occupy the de-vegetated land. If the plant community succession was allowed to proceed naturally without human activity on a certain floodplain area, it might need over 20 years to recover before returning to a mature and high complexity stage. Recently, clearance of the bamboo forest for eucalyptus plantations by farmers has occurred in Ban Kham Chi and Na Pho Noi sites when we visited in the dry season. So, natural succession with multiple disturbances is becoming an increasingly common occurrence, even though the flood regime is basically unchanged for many decades. For the Ban Naa Pho Noi site, its hydrological regime has been modified by the upstream *Nam Oon* storage dam and irrigation project, causing increased downstream erosion, altered flow patterns and a possible decreased likelihood of prolonged flooding in the dry season, due to water being held back in the reservoir. It is uncertain what impact that this change in flows has had on the floodplain plant communities.

Conclusions

All three study sites show marked changes of vegetation habitats from the natural state. Their present state is much degraded and altered from how it might have appeared forty or fifty years ago. From interviews with local people and from what is already known about the Songkhram Basin, five decades ago the area was covered with extensive lowland, semi-moist evergreen forest and dry dipterocarp forest extending down to the margins of the seasonally inundated area of floodplain (Blake and Pitakthepsombut, 2006). There has been widespread removal of vegetation cover and conversion of natural habitat to agricultural uses across the Nam Songkhram Basin. Although estimates vary, there is thought to be no more than 10 – 12 % natural forest cover remaining in the entire LSRB, most of which remains in a heavily degraded state. Particularly hard hit has been the once extensive seasonally flooded forests, now limited to a few discrete patches in a heavily degraded state. A Khon Kaen University study comparing satellite and aerial photograph data between 2001 and 2005, found that the area of seasonally flooded forest declined from 91.58 km^2 to 69.24 km^2 respectively (Homcheun, 2007, unpublished data). This same study found that the area of *paa boong paa thaam* that could be considered "healthy" was just 10.3 % or 7.12 km^2 of the total area remaining in 2005. As our study suggests, the area and quality has continued to decline since then.

From field observations and previous experience of floodplain environments in Northeast Thailand, it was found that plant species, communities and habitat are intimately linked to local people's livelihood patterns and thus present a strong social linkage. At the same time, it was observed that some native plant and fish species have closely linkages, through such pathways as provision of habitat, food and shelter to fish, especially during times of flooding. Thus, it could be surmised that anything which reduces the health of the native plant communities and habitats, will automatically have a negative impact on both aquatic fauna that relies on them and the people who depend on the fish and/or plants, for either all or part of their livelihoods.

There were some interesting characteristics noted, such as groups of similar tree types occurring in the higher land of the area study. Water could also affect the seed dispersal mechanism and pattern of plant species. This can be seen from the uniform cluster of flora that occurs in units comprising many species. The vegetation which grow at study sites have not only adapted themselves to the harsh environment in the wet season, but are also able to cope with the effects of water stress in the dry season. For satisfactory seed dispersal mechanism within this type of habitat, the flora mostly flowered or produced fruits during the rainy season. Although plants in the study sites grow with excess water in the wet season, during flooding they are under water stress. Many plants have adaptations to survive and be able to pass a month or more under water such as producing aerial roots or prop roots; elaborate fruit or seed parts to allow easier water dispersal; while some flora are light weight so they float easier.

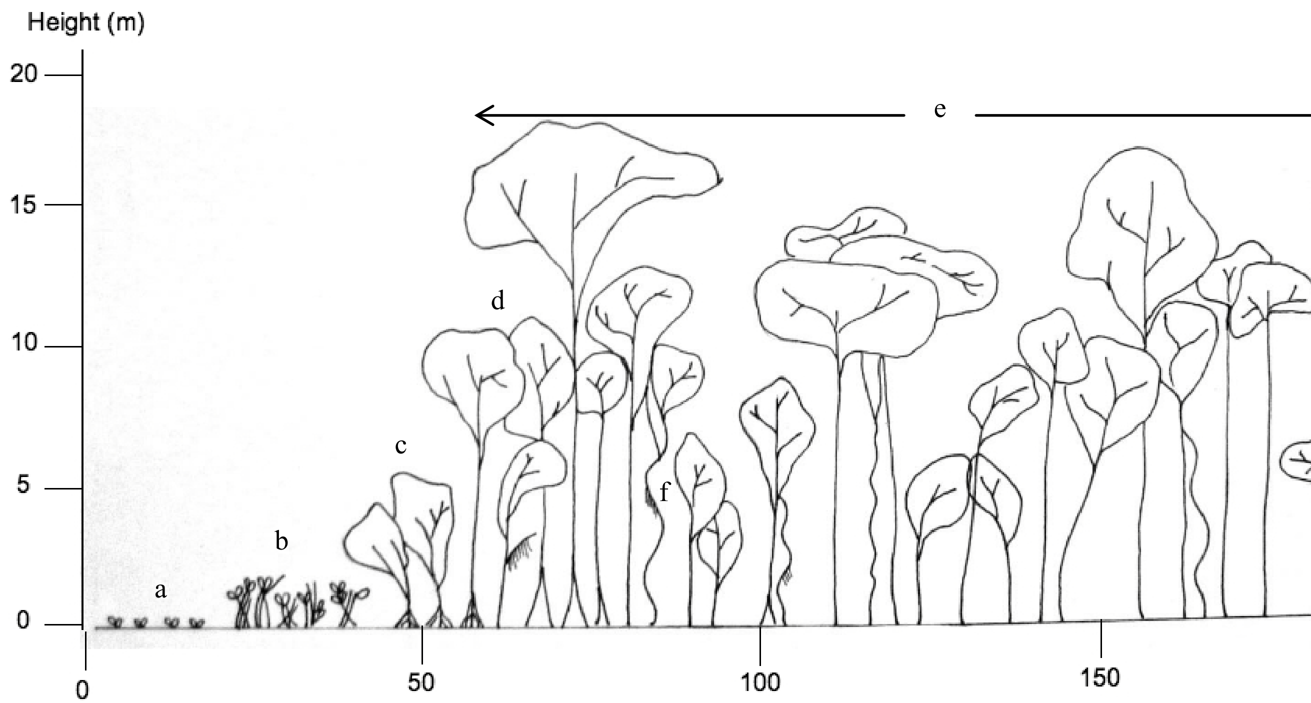
Table 3.5.1 Showing favoured periods for collecting certain species of edible plants and mushrooms at the study sites through the year

Items	Month								
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Se
1. Edible plant: Saeng (ยอดแส), Pak Bor (ผักบ่อ), Ben Nam (ยอดเบ็นน้ำ), Huling (ผลหูลิง), Pak Som (ผักส้ม), Pak Khom (ผักขม)			+ + +	+ + +	+ + +				
1.1 Kai Hangnak (ไคร้หางนาค)	+ +	+ +	+ + +	+ + +	+ + +	+ + +	+ +	+ +	+
2. Aquatic edible plant; Pak Bung (ผักบุ้ง) Buabok (บัวบก) Young shoot of water hyacinth flower (ดอก อ่อนของ ผักตบชวา) Bual uang (หัวบัว) Paengpuay (แพงพวย) Bua Sai (บัวสาย) Buabaa (บัวบา)			+ + +	+ + +	+ + +	+			
2.2 Kra Jab (ผลกระจับ)								+ + +	+ +
3. Bamboo shoot (หน่อไม้)			+	+ +	+ + +	+ + +	+ + +		
4. Mushrooms (เห็ด)			+ +	+ + +	+ + +	+ +	+ +		

Symbol meaning: + + + Regularly collected

+ + Medium amount collected

+ Insignificant amount collected



<u>Figure 1</u> Generalised profile diagram of plant community in flood plain area

(a) herb zone in open land (b) strongly embraceable shrub community

(c) small tree; *Hymenocardia wallichii* , *Phyllanthus reticulates*

(d) aerial root tree and stilt root tree; *e.g. Mallotus thorelii* , *Garcinia schomburgkiana*

(e) tree and climber vegetation

(f) aerial root woody climbers

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E-Flows in the Nam Songkhram River Basin
David JH Blake et al
Annex 4: Scenarios Workshop

Introduction

One of the principal components of the E-Flows study was a scenario-building workshop in May 2006. The Scenarios Workshop was held with the purpose of bringing together the Intermediate E-Flows Assessment Team following the wet and dry season field studies to discuss their findings in relation to a number of potential development scenarios for the Nam Songkhram Basin. The workshop provided a valuable chance to reflect on the main lessons from the field study and use them to consider alternative scenarios and assess what might potentially happen at each site on the basis of enhanced knowledge about flow changes and hydraulics. Three scenarios were selected for the workshop with reference to past development trends and socio-political considerations at national, regional and local levels. It was anticipated that the findings and conclusions of this workshop could be used to inform and influence the outcome of the Multi-Stakeholder Meeting that followed the scenario workshop (see section ??). Additionally, on the last day of the workshop, a limited number of participants from various state agencies were invited to observe the proceedings and listen to preliminary findings, as a way of exposing to stakeholder scrutiny the E-Flows approach and methodology.

Future Scenarios Examined

Following discussions between the Nam Songkhram E-Flows Technical Working Group (TWG) members and various project partners, it was decided to take forward four possible scenarios for consideration at the Scenarios Workshop held in Udon Thani in May 2006. (The fourth was ultimately not considered due to time constraints.) These were justified by taking into account several considerations: 1) the general context of the Nam Songkhram Basin, derived from background information and implementation of the MWBP Demonstration Site for last 3 + years; 2) reference to long-proposed major infrastructural projects by key water resources management stakeholders; and 3) what, if any, non-infrastructural project options could be considered as alternative ways forward for sustainable management of basin, natural resources and water resources, coinciding with general flows considerations.

With these criteria in mind, the following scenarios were conceived as potential development pathways that might be applied by water resources planners and decision-makers:

1. Nam Songkhram Dam
2. Water Grid plan
3. Business as usual
4. Alternative development paradigm

These scenarios are discussed here in brief.

Nam Songkhram Dam (plus Nam Oon Watergate)

This scenario is one of the longest-standing development projects proposed for the Nam Songkhram Basin. It dates back to an early comprehensive development plan for the Basin put forward by NEDECO (Netherlands-based consulting firm), who were working for the Interim Committee for Coordination of Investigations of the Lower Mekong Basin, forerunner to the Mekong River Commission (MRC). The Pre-Feasibility Study of the Nam Songkhram Basin Irrigation and Flood Control Development (NEDECO, 1983) main report, in consideration of a large dam or water "regulator" built just upstream from the Mekong confluence, concluded that:

"*The construction of a regulator near the mouth of the Nam Songkhram to create a storage reservoir in the floodplain appears to be the most economical way of providing irrigation water in the Nam Songkhram basin. Such a reservoir can ultimately irrigate nearly all irrigable land in the basin. Neither upstream reservoirs nor the regulator are feasible for flood control. The proposed regulator is for the purpose of irrigation only……*"

The Nam Songkhram Basin Project proposed by NEDECO was never adopted, but the idea of a regulator dam, with upstream reservoir and a series of irrigation pumping stations around the periphery was later adopted by the Department of Energy Development and Promotion (DEDP) as one component of its grandiose Northeast Thailand-wide Khong-Chi-Mun (K-C-M) Project. A plan was drawn up to build a 15m high, 130 m wide dam with five gates about 8 km upstream from the Mekong confluence at Ban Na Phiang, Tha Utaen District. The dam would create a 255 km^2 reservoir, with the capacity to store 420 MCM water at a max storage height of 147.5 m asl, which theoretically could irrigate a total of 394,500 rai (i.e. 63,120 ha) of farmland using electric pumping stations and canals. In 1995, the entire Nam Songkhram Project (which also included related dams to be constructed on the Nam Oon and Nam Gam rivers) was estimated to cost about $US 400 million. Land for the headworks was purchased and the project was strongly backed at the time by local and national politicians.

The project attracted strong resistance from local villagers who would be impacted and environmental NGOs, while academics at public hearings disputed the findings of the EIA which was rejected on several occasions by the National Environment Board (NEB). Eventually, in March 2002, the Cabinet passed a resolution agreeing with the findings of the NEB that the project would have unacceptably high impacts and the benefits did not justify the costs (Blake and Pitakhepsmbut, 2006a). Despite the apparently unequivocal rejection of the project by the government and the later dissolution of DEDP during a bureaucratic reorganisation in 2002, responsibility for the Nam Songkhram Project was shifted to the Royal Irrigation Department (RID), under the Ministry of Agriculture and Cooperatives (MoAC) for possible future implementation.

The Nam Songkhram Project, under RID, has subsequently been proposed in the long-term Basin Development Plan for the 2007 – 2027 period and was listed as being 22nd in terms of priority for development with construction scheduled to begin within 15 years time at a budget of 1,364 million baht (Department of Water Resources, 2006). At 20th priority place in the same list and scheduled to begin in 2011, is the so-called Nam Oon Watergates Project at a budget of 250 million baht. Also under the aegis of RID, both of these infrastructure projects received a boost in 2005 during the height of the annual flood in late August, when the former Prime

Minister Thaksin Shinawatra took a helicopter ride over the Lower Songhkram Basin and declared it a “natural disaster”. He promised to a gathered crowd in Sri Songkhram District that he would use some of the government’s 400 billion baht water resources management budget to solve the flooding problem and provide water for farmers to use in the dry season, and recommended spending 1.3 billion baht on building the Nam Songkhram Project and Nam Oon Watergates Project.

In March 2006, a government organized public hearing was held in Sri Songkhram District town to announce the Nam Oon Watergates Project, which was described as a multi-purpose “irrigation and flood prevention project” by RID provincial officials. The technical details of the project are summarised below.

Nam Oon Water Gates[1]

Site Location:	Sri Songkhram Sub-District, Sri Songkhram District, Nakhon Phanom Province
Coordinates:	48 QVE 197 – 481
Map series:	5844 III
Watershed area above project site:	3,502.00 km^2
Basin slope around project site:	1:8,000
Average annual rainfall:	1,907.9 mm
Average no. of days of precipitation:	83.2 days
Average annual evaporation rates	1,015.92 mm
Average annual flow at project site:	2,303,297,898 m^3/year
Type of Water Drainage Structure: Size: Number: Weir overflow height: Water drainage by Q Design: Water pipes on right bank:	Slide Gate 8.00 x 7.00 m 6 gates 5.00 m 1,152.26 m^3/min Number according to suitability Number according to suitability

[1] Source of data was an internal document issued by the Nakhon Phanom Provincial Irrigation Project Office in August 2004, titled: “*Summary document to propose to Agriculture and Cooperatives Commission in their survey mission to Nakhon Phanom Province on 6 August, 2004. Nam Oon Water Drainage Gates Construction Project and Nong Sang Dredging Project, Sri Songkhram District, Nakhon Phanom Province*”.

Water pipes on left bank:	
Storage volume at full operating height:	Approx. 50,000,000 m^3
Area of agricultural land to be irrigated:	Rainy season – about 60,000 rai Dry season – about 28,000 rai
Construction costs:	About 250 million baht[2]

Hence, while an unstable political situation and change of government in September 2006 made it seem unlikely that the Nam Songkhram Project would go ahead in the short to medium term (i.e. < 5 years), there has been a recent movement to push forward the Nam Oon Water Gates Project on the largest tributary of the Nam Songkhram, which itself is a river already impacted by a large upstream dam and irrigation project (RID's Nam Oon Irrigation Project in Sakhon Nakhon Province) and has a regulated dry season flow pattern. The site for the proposed Nam Oon Watergates project is about one kilometre from the Nam Oon – Songkhram confluence, where the floodplain is very wide and flat, so any reservoir created would tend to be shallow and cover a large surface area.

The design would necessitate the use of bunds to contain the water and the loss of a lot of valuable floodplain land, seasonally flooded forest, various wetland features (natural and artificial) and a large area of dry season rice fields cultivated by villagers. Additionally, much of the area to the west of the Nam Oon river, is nominally owned by a large agribusiness venture, which formerly used the land for intensive tomato cultivation, but has been abandoned for several years now. The plantation area has largely been recolonised by *Mimosa pigra*, an invasive alien species with limited natural vegetation regrowth. Just downstream of the proposed dam site is a biologically rich remnant patch of seasonally flooded forest that is a known feeding ground of the critically endangered giant Mekong catfish and other important fish species, which would be sensitive to nearby large developments (see Annex 9).

Water Grid development scenario

The so-called "Water Grid" is an ambitious nationwide project which envisages providing irrigation to 97 million rai of land by the year 2027, from the present "30 million rai" (Molle and Floch, 2007). It was launched in 2003 by the Thaksin Shinawatra government and estimated to cost $US 5 billion as part of a massive programme of implementing so-called "mega-projects". It has its roots in grand projects to "Green Isaan" or irrigate massive swathes of the "poor and arid" Northeast, dating back to the US interventions of the 1960s and planning for the Pa Mong Hydroelectric Project on the Mekong mainstream which eventually led to the Khong-Chi-Mun Project, under the DEDP (see Scenario 1 above). However, unlike K-C-M Project which planned to pump water out of the mainstream Mekong, a key feature of the Water Grid Project is the inclusion of trans-basin water diversions from Thailand's neighbours, including Burma, Cambodia and Lao PDR.

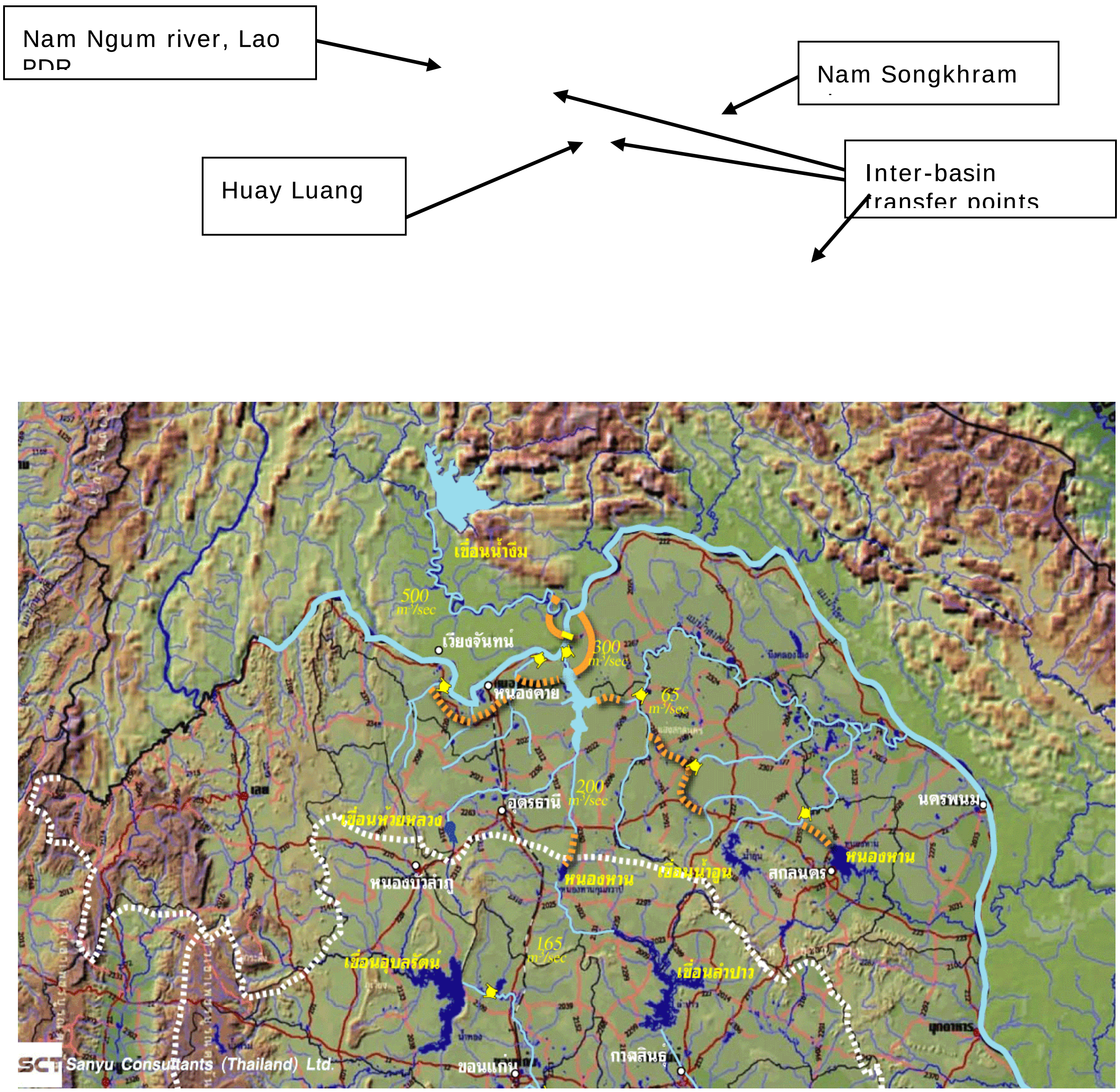
[2] This cost estimate has since been revised upwards to 300 million baht, according to a figure given at a Public Hearing for the Nam Oon Water Gates Project in Sri Songkhram District on 29 March, 2006

In Northeast Thailand's case, there have been several plans on the drawing board for transferral of "excessive and wasted" water resources from Lao PDR to the "arid and poor" Isaan, namely from the Nam Ngum, Xe Bang Fai and Xe Bang Hiang Basins and then under/over the Mekong River into contiguous provinces of the Northeast. These plans are being primarily promoted by the DWR, but with strong explicit and implicit backing from certain senior political figures over the past five years (Molle and Floch, 2007). According to a presentation given by a project proponent at the Research and Development Institute, KKU in February 2005 (see graph above), which argued that the Water Grid "*seems to be the only option*" for solving poverty in NE Thailand, the project would be accomplished through the following steps:

1. Distribute water by pipes, canals, etc. from sources to required areas.
2. Promote farmers to grow high value crops and manage water distribution through:
    - Farmer Capacity Strengthening
    - Seeds, bionic farming and irrigation techniques
    - Formation of farmer organization for O&M of lateral pipes (Main pipes by private sector) and for dealing with SPV
    - Meter and charge for delivering water
    - Provision of start up fund
    - Link with other government programs: World Kitchen, OTOP, SME, Village fund, etc.
    - Agricultural extension by aggressive on farm visits
3. Create private company (SPV like) for local & international marketing
    - Contract Farming
    - Brand name building
    - Cooperation with other countries

In the case of the Nam Songkhram Basin, the plan involves transfer of water from Nam Ngum, under or over the Mekong to a new storage dam on Huay Luang stream in Nong Khai and Udon Thani, and then pumped trans-basin into the Songkhram Basin via Ban Dung District at a rate of 65 cumecs, as illustrated in the map below. The water would then be distributed across the Songhram Basin in a series of canals and pipes to where it was required. It will also be noted that there is a plan to further transfer out of the Nam Songkhram Basin to the neigbouring Nam Gam Basin, via Nong Han (another wetland of "international significance").

Plate 4.1. Map of proposed transboundary and inter-basin water transfers that would impact the Nam Songkhram Basin under the Water Grid Project



The above scenario inevitably assumes a massive expansion in irrigation infrastructure across the Songkhram Basin and adoption of irrigated agriculture, despite evidence to the contrary that the former will guarantee the latter. This point is well illustrated by the situation at the nearby Nam Oon Irrigation Project, where despite massive investment in infrastructure and plentiful, good quality and free supplies of freshwater, there is still relatively low adoption and significant levels of out-migration present in the irrigated area. Hence, the Water Grid assumes that not only will people return to farm the land, but earnings from agriculture will be superior to that available in the non-agricultural sector. It says little or nothing concerning the potential environmental impacts of such a scheme, with the only obstacles to its development in the RDI presentation mentioned above being:

- "Transferring water from water rich areas can be a sensitive issue, and
- Difficulty in coordination among bureaucratic units"

"Business as Usual" scenario

This scenario assumed that there will be no major irrigation developments in the Songkhram Basin in the next 20 years, but there will be a continuation of the general development trends of the past 30 years or so, which have led to the rather "messy" situation seen today. To summarise, this period roughly coincides with the clearance of the formerly vast primary and secondary forests in the LSRB, by a mixture of logging concessions, commercial charcoal production and massive in-migration from other Northeast provinces and subsequent conversion of land to agriculture. Since, the mid-late 1970s, there have been a number of clearly discernible trends and phenomenon occurring in the LSRB, as outlined below:

- The gradual introduction and adoption by local people of agricultural technological innovations which allowed a parallel expansion and intensification of cultivation, e.g. tractors, irrigation pumps, chemical fertilisers, pesticides, etc.
- The opening up of domestic and foreign markets with concurrent improvements in communication infrastructure and central policies allowing market penetration and commodification in rural areas.
- Massive investment in irrigation infrastructure, both gravity-fed irrigation e.g. Nam Oon RID Irrigation Project in Sakhon Nakhon, and pumped (diesel and electric) irrigation projects under RID, ARD, DEDP from newly-created shallow reservoirs and mainstem rivers. Often dams, reservoirs, weirs, etc., were built with no accompanying water delivery system, as increase in storage capacity was the primary agency goal. At the same time, there was much agency overlap of duties and poor inter-agency coordination.
- A parallel process of central govt. financial subsidies to agribusiness to locate in the LSRB, which was identified as having under-utilised land, fertile soils and high potential for agricultural intensification under modern management methods (e.g. NEDECO, 1983). A systematic process of acquisition of floodplain land, previously under local ownership (non-titled) or common/public land utilised for grazing livestock and harvesting NTFPs/hunting/fishing by villagers, occurred over a fifteen year period or so. An estimated 60,000 rai was obtained by agribusiness along the LSRB (Watershed, 1999), and despite a considerable decline in operations since,

the agribusinesses legacy is still strongly felt in the LSRB and very much a factor in future development scenarios.

- About ten years ago, a policy of expansion of rubber tree cultivation across the upper Northeastern provinces was pursued by the government. This was both to replace cassava and sugar cane, and to bolster production from Southern provinces, due to strong overseas demand. At first, expansion was relatively slow but in the last few years there has been a boom in rubber plantations, both by local people and outside investors who have bought up land in many areas. While some of the plantations are on former cash cropped land, much of the expansion has been at the expense of local forests, which have rapidly dwindled in the last three years (personal observations; 2004-07 from land, air and satellite data).
- In the last few years, there has been a rapid expansion of eucalyptus plantations, mostly by local people, on floodplain land throughout the basin. The trend is rapid and would seem to be accelerated by a perceived high price for eucalyptus wood (stimulated by demand from both pulp and paper manufacturers and the charcoal industry) and the extension of nursery technology to the household level. The trees grow very quickly and need little or no maintenance. Furthermore, they are highly resistant to drought, floods and fire, making eucalyptus an “indestructible crop”.
- A massive programme of dam, weir, watergate construction and river canalisation took place in the Upper Basin from 1998 onwards, mostly under the control of the Acclerated Rural Development Office (ARD). Although ARD became defunct in 2002, its construction programme was mostly passed on to DWR which continued it on, building medium-size dams for “irrigation and flood control” on the Songkhram mainstream in Ban Dung District, Udon Thani province and upstream between 2002-04. These structures have been passed on to “the people” on completion and are now lying abandoned to all intents and purposes.
- As both a consequence of inappropriate development (like the weirs/dams described above) and the expansion of a salt mining industry in the middle and upper Songkhram Basin (especially the districts of Ban Dung, Wanon Niwat, Ban Muang and So Phisai), there has been an increasing problem of both land and water salinisation. The land salinisation problem is highly visible near the production areas (as is land subsidence in places) and in certain select areas away from mining activities e.g. downstream of dams and reservoirs where the water table has been artificially raised. Certain tributary streams and the mainstream Songkhram suffer from a rise in salinity at the start of the rainy season, before it is diluted out by heavy rainfall. There are plans underway to permit potash mining in the Songkhram Basin, as considerable deposits are known to exist.
- Local authorities, at both provincial and sub-district levels, are requesting and obtaining bigger budgets for the construction of river embankments, purportedly to protect against erosion and floods. While they may have some impact for the former goal, they would appear in most cases to be ineffective in achieving the latter goal and may actually exacerbate it locally.
- There has been a gradual intensification in fishing methods and concurrent abandonment of traditional fishing methods and gears. This has been going on for the past 40 years or so, since the introduction of monofilament nylon netting and commercialisation of the subsistence fishery. While forest

destruction and ecosystem degradation are thought by some to be the most significant factors behind fishery decline, it must be acknowledged that there is widespread use of locally destructive fishing methods, including poisoning and electro-fishing, plus a range of illegal fishing gears, including stationary trawl nets (*dtawng*), *gad* and fine-meshed seine nets (*uan tap taling*).

All of the above factors, and others not mentioned, have played a significant role in the decline of biodiversity, system productivity, habitat degradation and loss and general changes in natural resources, over the past few decades. The rate of change of land use in the recent past suggests that the LSRB has been one of the last frontiers of Northeast Thailand to change from largely native vegetation and habitats, to agriculture and human-disturbed habitats. The rapid decline in forest and natural wetland habitats (e.g. “marsh and swamp”) and concomitant increase in residential land, idle land (i.e. abandoned agricultural land like that of Suntech Group Ltd’s plantations near Ban Tha Bor) and jump in “Water Resources” (mainly shallow reservoirs) are noteworthy.

Although there appears to be an alarming decrease in forest and wetland resources over a relatively short time period, the data it indicates for forest cover in the LSRB does not tally with official figures for forest cover, which are compiled by the former Department of Forestry[3]. While officially, forest cover is supposed to be just 3.6 % in the Lower Songkhram Basin (see Table 4.1 below), analysis of actual forest cover from satellite images suggests it is nearer 12.1, which in a smaller representative sample of area of LSRB, indicated a forest area of 13.5 % of the total land area in 1998. This contradiction between actual and official data helps explain why the seasonally flooded forest has long been officially classified as “wasteland” or “scrub forest” at best, and thus has not been subject to any state protection or coordinated management. However, differences between theoretical forest cover and actual forest cover are not exclusive to the Lower Basin, but are a common feature of all sub-basins. Table 4.1 also gives interesting data on the respective watershed areas and annual run-off of each sub-basin, which illustrates the relative arbitrary nature of the divisions and the rather surprising figure for run-off for the Lower Songkhram Basin, as if it is a separate entity, not connected to all the other sub-basins. The total figures at the bottom of each column in Table 4.1 were calculated by the author and were never indicated in the original document, leading to a conclusion that the Nam Songkhram Basin as a complete entity or geographical unit, is currently overlooked by basin planners and policy makers.

Table 4.1: Nam Songkhram Basin Forestry Cover and Run-Off

Sub-basin	Total Area (*rai*)	Official forest & watershed area (1A, 1B) (*rai*)	Actual forest area (*rai*) from satellite data	Annual run-off (MCM)

[3] The Department of Forestry has now been split, with some sections remaining in the Ministry of Agriculture and Cooperatives and some i.e. National Parks, Wildlife and Plants being absorbed into the Ministry of Natural Resources and Environment as a new department. At the provincial level, conservation of forests and natural resources (including wetlands) is overseen by the Provincial Office of Natural Resources and Environment.

Huay Khong	445,551	187,733	11,742	362
Huay Hi	467,618	47,712	14,671	426
Upper Songkhram Basin	2,053,584	480,784	120,570	2,629
Lower Songkhram Basin	1,928,293	96,465	233,728	750
Nam Yam	1,087,645	40,662	148,963	1,310
Nam Oon	2,228,561	419,764	586,308	2,500
TOTAL	8,211,252	1,273,120	1,115,982	7,977
TOTAL (ha)	1,313,800	203,699	178,557	
Km^2	13,138	2,037	1,786	
%	100	15.5	13.6	

(Source: Report complied by 5 private consultancy companies, contracted to make a "Participatory Water Resources Plan for Mekong River Basin, Area 3 (Northeast Thailand"), submitted to: Office of Water Resources Policy & Planning, Dept. of Water Resources). Data refers to six DWR designated Sub-basins located within the overall Nam Songkhram Basin, which itself comes under the Mekong River Basin, Area 3, one of 25 "river basin" areas nationally.

In the past two or three years there has been a marked continuation of the trend noted in Table 4.1, with further encroachment of lowland seasonally flooded forest and upland secondary forest types for both rice fields and rubber or eucalyptus plantations, with an acceleration of the bush clearance happening in the 2006-07 dry season. If the present trend continues unabated, it is questionable if any *paa boong paa thaam* will remain in a few years time. In the meantime, the area of dry season rice (*naa prang*) has grown by about 250 % in two years according to Sri Songkhram District Agriculture Office data and the competition for water resources, as well as progressively scarcer wetland biological resources is increasing. As there is now little natural forest left, apart from odd pockets of sacred or community forest, then the "Business-as-Usual" scenario assumes that there will be greater demand at the local level for small water resources development, whether on-farm or by local authorities, especially the Tambon Administration Organisations (TAOs). Whilst this process of decentralisation following the 1997 "People's Constitution" (now annulled) brought hope of more enlightened natural resource management, the reality has proved more complex and in need of detailed examination to see where the strengths, weaknesses, opportunities and threats actually lie. In summary, this scenario makes the assumption that the trends highlighted above will continue largely unabated, with the only constraints being socio-economical and bio-physical depletion of resources.

"Alternative Development Paradigm" scenario

This last scenario takes a different perspective than the three scenarios presented above. It implicitly recognises that the development paradigm taken to date, exemplified under the "Business as Usual" Scenario, has not proven successful, sustainable or beneficial, either to the environment or to local communities, while the two first scenarios, if implemented would very unlikely meet the ambitious goals set based on past experience of smaller projects, while creating a whole new set of environmental and social problems formerly absent, which would be extremely expensive to rectify, while possibly causing permanent loss of valuable wetland habitats, biodiversity and services. Thus, it is likely that if basin stakeholders were offered informed choices outlining alternative development scenarios based on the core principles of **equity, sustainability, participation and decentralization** (WCD, 2000), then outcomes would be more beneficial to all and sustainable than presently is the case. This section merely lays down some potential ideas for discussion and elaboration in the Workshop itself, rather than being a comprehensive framework.

If the premise is accepted that the present development paradigm has externalized, or at best, not fully accounted for many social and environmental costs, then a search for a better, more holistic and sustainable paradigm can begin. One where "people really matter", changes to the ecosystem are made with caution (i.e. the "precautionary principle"[4]) and sustainable development is seen as a gradual process where changes cannot be forced and takes into account social, cultural, spiritual, ecological and economical differences at the local level (i.e. a grassroots, bottom-up approach). It also endorses the need to focus on policies and institutions which enable sustainable development, especially in the key areas of agriculture and water resources management.

In the past, it is recognised that most development of water infrastructure has been supply-driven, rather than demand-driven, leading to the construction of many inappropriately designed and sited weirs, dams, reservoirs, etc. At the same time, most support for agriculture has focused on increasing productivity at all costs, tending to lead to a narrowing of crop types and varieties, dependence on export-led crops with fluctuating prices, heavy use of agri-chemicals, unsustainable use of water resources, and rapid expansion of the agricultural frontier into sensitive wetland habitats. This has led to the typical boom-and-bust cycle of farming seen in Northeast Thailand and furthered the breakdown of rural society, triggered out-migration and degradation of the environment, that has been recorded elsewhere (see Bello et al, 1998 for a comprehensive account).

A key starting point for an alternative development paradigm would be the formation of a truly representative body or institution to oversee Basin development, which goes beyond the rather centrally-driven, narrow-focused, poorly-managed and geographically-limiting RBO's, under DWR. While these RBO's provide a good potential basis for improved water resources management, in the case of the Songkhram River Basin it does not appear to be meeting its mandate and one of the main reasons for this is the arbitrary division of the whole basin into six sub-basins. This not only leads to confusion (as they report to the much larger Mekong Basin RBO, rather than coordinate development activities amongst themselves locally), but also means there is no overall Basin institution that can manage this 13,000 + km^2 ecological unit across 4 provinces with an estimated population of 1.45 million people

[4] The "Precautionary Principle" states that if a public action or policy may cause severe or irreversible harm it should not be carried out, despite the absence of full scientific certainty that harm would ensue. The burden of proof thus falls on those who would take the action.

(Blake, 2006). Hence, the merits of working towards forming a Nam Songkhram Basin Management Authority (or similar body) with comprehensive representation from state and non-state actors, should be a primary goal of any alternative development scenario. This “Nam Songkhram BMA” would have a broad mandate and remit of responsibility, beyond solely water management issues, to include all natural resources management and environment-related issues of relevance to the basin with adequate long term funding and support from all parties to become established as a permanent body.

Having established a “Nam Songkhram BMA” with genuine participation of and acceptance by diverse stakeholders, the possibilities for putting forward holistic and multi-sectoral policies and plans, which build on and enable existing state policies (e.g. “The Sufficiency Economy” ideas and practices; or the King’s Integrated Farming theory) and put them into practice locally. The cooperation and coordination of a wide range of government agencies is essential, especially the locally empowered TAO’s and some provincial line agencies e.g. Dept of Agricultural Extension, Land Development Department, RID, ALRO and DoF. Some potential concepts in various fields, but are in fact usually quite cross-cutting in practice are laid out below, but are intended as just starting points for discussion, rather than the last word.

Agriculture

- Promotion of sustainable and/or organic farming practices
- IPM training
- Soil conservation training
- Reform of extension service to be more responsive to farmer needs and geographically comprehensive
- Promoting on-farm water management solutions
- Careful monitoring of intensive farming practices, for both environmental and human health impacts
- Removal of perverse subsidies on destructive practices (e.g. fast-growing monocrop trees) or based on false-assumptions (e.g. flood as “natural disaster”)
- More money spent on wetlands-based agricultural research
- Policy changed on agribusiness promotion and reform of sector in Songkhram Basin
- ALRO reformed to recognise role and importance of wetlands, and to allow conservation of natural habitats to qualify for bank loans
- Conservation-friendly subsidies promoted in govt. schemes
- Greater emphasis and budget devoted to the role and functions of large livestock (cattle and buffalo) in wetlands management and socio-economics of the LSRB

Fisheries

- Greater budgets available for capture fisheries management and research
- Decrease in subsidies for intensive cage culture of fish, esp. tilapia

- Greater attention paid to impacts of environmental impacts of exotic fish species on native stocks of fish and ecology
- Genuine promotion of fishery co-management at all levels, and move towards community-led co-management as a more sustainable and positive way forward
- Reduction in role of Dept of Fisheries from that of “policeman and enforcer” to one of “fishery advisor and enabler” to increase local cooperation and community relations.
- Assist in community-led efforts for fishery rehabilitation, beyond the rather narrow (at present) system of fish conservation zones (FCZs). This could include such ground-breaking moves (in Thailand at least) as dam or weir removal and flooded forest protection zones.

Natural Resources and Wetlands Management

While this category spans all the others, there are certain issues that are more urgent, which would mostly fall under the theoretical remit of the Provincial NR & E offices at present, but are not being practiced for various reasons. These include:

- Detailed GIS resource mapping across the Basin, with information freely available in the public sphere
- Research into the role and functions of the Songkhram wetlands and more effort being made to ascertain the links with the Mekong hydrology and ecology
- Greater efforts to communicate importance of Nam Songkhram Basin to local, national and regional constituents
- Taking forward of efforts to declare LSRB a Ramsar Site Wetlands of International Importance and coordinate management action plans accordingly
- A moratorium on further large-scale water resources development projects (adopting the precautionary principle), and studies initiated into impacts of existing dams, weirs, watergates, etc. Where necessary provide advice/funding on removal of ineffective or redundant structures.
- Closely monitor any new developments in Nam Songkhram Basin which might negatively impact on wetlands health, bearing in mind that 54 % of Basin can be classified as a “wetland” in broadest definition (Sombutputorn, 1998).
- Degraded agribusiness lands and other degraded lands restored to health
- Assistance given to communities and schools to practice regular environmental monitoring (esp. water quality), as a way to maximise community involvement and responsibility for water and wetlands management

Industry

- Close environmental monitoring of existing industrial facilities and making recommendations where necessary to relevant govt. agencies for action e.g. in event of persistent pollution problems or breaches of licence agreement

- Inquiry initiated into environmental impacts of salt mining, with aim of improving management practices and understanding environmental limits and thresholds, to inform any future expansion by industry.
- Ensuring that any future industrial development is in keeping with status of Songkhram wetlands (i.e. potential Ramsar Site) and uses best practice in its processes, that minimise pollution and follow "polluter pays principle".

Urban Development

Carefully monitor and assess the impacts of increased urbanisation and demographic growth trends on the health of the Nam Songkhram Basin wetlands, with research findings being shared with relevant national and regional bodies.

- Close watch on urban pollution of watercourses, and help (both financial and advice) extended to communities or institutions to use biological filtration methods to treat water before release into environment.

The above scenarios were submitted to participants in advance of the Workshop for consideration and were intended not as rigid scenarios, but rather were aimed to act as stimulants to discussion and invite further elaboration or adaptation, according to the specialist's opinion.

Summary of Development Scenario Implications to Hydrology and Ecology

Scenario1: **<u>Nam Songkhram Dam (plus Nam Oon Watergate)</u>**

Major hydrological impacts:

- Blocking of flow near river mouth
- Creation of large shallow reservoir stretching back nearly 200 kms upstream
- Some impact on stopping Mekong water flow and sediment backflow in rainy season

Major ecological impacts:

- Impact on fish migration patterns (up and downstream)
- Stillwater reservoir – change from riverine conditions and loss of floodpulse – change in Water Quality
- Loss of floodplain vegetation (*paa boong paa thaam*) to reservoir – possible WQ problems as it rots
- Change in aquatic faunal/floral community and productivity
- Possible mobilisation of salt layer underneath and raising to surface
- Irrigation impacts on fragile, low fertility, salinisation prone land
- cf impacts of Khong-Chi-Mun Project watergates

Major sociological impacts:

- Would require relocation of several villages (7?)
- Would lose much productive agricultural land on floodplain (naa prang)
- Loss of fish and other aquatic resources
- Loss of flooded forest common property resources
- Potential public health risks

NB: for Nam Oon Project: Ecological – hydrological impacts – similar to Nam Songkhram Project on smaller scale. WUP-FIN data indicates that flooding prevention is not possible by damming.

Scenario 2: **Water Grid development scenario**

Major hydrological impacts:

- Mainstream and tributaries further split into discrete sections by dams/weirs, blocking natural flows
- Abstraction of water for irrigation in dry season, from some localised stretches, with possible drying up of river channel.
- Other stretches may have extra flows (above natural), when little demand for irrigation or return flows from low efficiency parts
- Extra 65 cumecs pumped into system, causing overall higher dry season flows in lower reaches??

Major ecological impacts:

- Change in flow patterns upsetting fish migration patterns and possible key events in fish lifecycles and migratory cues
- Loss of shallow water areas, important for some fish
- Greater erosion in dry season, causing higher sediment load and increase in turbidity. Loss of primary productivity. New conditions favours some species.
- More irrigation and intensive agriculture causing decrease in water quality, impacting sensitive fish and aquatic organisms.
- Increased soil and water salinisation. Possible risk of long-term land degradation and eventual abandonment.
- Risk of pollution events from misuse of pesticides, under increased intensive agriculture
- Where over-abstraction occurs (especially tributaries), less flow impacts sensitive species.

Major sociological impacts:

- More water competition for irrigation, may lead to increase inter-village and intra-village conflicts, as has happened in many other basins in Thailand

- Fundamental change in traditional agricultural practices to more high investment, high risk systems, will inevitably mean many farming families “fall by the wayside”.
- A likely consolidation of farms by bigger, wealthier landowners and agribusiness interests. Decreased farm ownership and greater tenant or wage labor, for some seasonal operations.
- Move from rice and food crops to monocrop plantation forestry and non-food crops e.g. bio-fuels or cash crops.

Scenario 3: Business as Usual scenario

Main hydrological impacts:

- Slightly more storage capacity in tributaries, may delay onset of flows / flooding early in rainy season, but not greatly as all shallow reservoirs. Will be greatest impact in dry year, if reservoirs do not fill up quickly.
- Greater pumped irrigation schemes in mainstream and tributaries may cause decrease in dry season flows.
- More on-floodplain structures and infrastructure will alter local flow and flood patterns. Some increase in local flooding, esp. where more embankments are built, hindering flood recession drainage.

Main ecological impacts:

- Increased fragmentation of tributary reaches, negatively impacting fish migration patterns and cutting off critical habitat at critical times of year (note all tributaries are now dammed in their lower reaches, apart from Nam Oon)
- Almost total loss of on-floodplain natural vegetation and flooded forest, causing loss of terrestrial and aquatic biodiversity and breakdown in many critical food chains
- Less nutrient recycling through flooded forest, so overall loss of productivity to system
- Increased use of agri-chemicals, causing decline in water quality, esp. in dry season and first flushes of year.
- Rise in localised soil and water salinisation. Land abandonment in longer term.
- Greater bank erosion, turbidity and sedimentation locally. Songkhram may become shallower as pools fill up with sediment.

Main sociological impacts:

- As aquatic and terrestrial habitats are degraded and simplified, and biodiversity lost, local people are less able to rely on natural resources for livelihood (food and income), and must buy more food.
- Greater production of dry season rice – labor implications

Conclusions from the workshop

While the overall workshop methodological process employed proved quite challenging to implement in practice, it was perhaps not surprising that no hard and fast conclusions could be drawn across the board of disciplines. There were certain constraints apparent such as time and specialists' familiarity with the technical terminology and complex concepts they were required to comprehend, digest with relation to their own discipline and analyse in a semi-abstract way. In the final analysis it was found that specialists were unable to complete the Ecology-Social Matrix tables according to original expectations. The Workshop did allow though an interesting dialogue to develop between specialists about future outcomes under different scenarios.

A significant and interesting conclusion from the hydrology component was the finding that any attempt at regulation of the Nam Oon in its lower reaches (Scenario 2) would have a very limited impact on flood levels and that according to the model, a complete absence of discharge from the Nam Songkhram river would lead to just a 10 cm decrease in the flood peak in the rainy season and just a small delay in flood arrival (see Annex 10). This is a function of the over-riding influence of the Mekong mainstream water levels, and thus any attempt at upstream regulation of the Nam Songkhram or tributaries will have a negligible impact on flood control.

While this finding alone would tend to offer strong evidence counter to the "flood protection" justification for building water management infrastructure (including the RID Nam Oon Watergates project and Nam Songkhram Project of Scenario 1), the reality is that these projects may be pushed ahead just on the basis of their supposed benefits for irrigation. If this occurred Sites 2 and 3 would be essentially altered irrevocably, as they would be transformed from their present variable habitat riverine floodplain state to a permanently inundated lacustrine (reservoir) state with little habitat diversity, and consequently, less aquatic biodiversity or productivity. For Site 1, it was not clear how far upstream of the Nam Songkhram Dam's reservoir it would lie, but the Team felt it would be influenced to an extent and see fundamental changes in social and environmental parameters, although quantifying them was more difficult. While the Intermediate EFA and Scenario Workshop were not designed to be an Environmental Impact Investigation or Social Impact Investigation studies, when delving into the combinations and permutations, both temporally and spatially, that a number of plausible development scenarios presents, then it rapidly becomes apparent that the level of investigation and consideration should be deeper than the relatively narrow time frame of the Scenario Workshop. What became apparent was the complexity of the relationship between hydrology and each discipline studied, would require more in-field and secondary data analysis for the team to build up a strong understanding of the implications of the fundamental changes that would result under each of the proposed scenarios.

From the perspective of fisheries, a view was expressed that both habitat degradation and simplification were likely to be bad for fishery productivity and biodiversity, reducing was at the present time a rich and diverse fishery by Thai standards. Similarly, any alteration of flows was bound to be negative to a high proportion of local fish species, many of which rely on flow triggers to complete their life cycles at egg, juvenile and adult stages. The notion that a reservoir fishery created could replace the rich and diverse river floodplain fishery that presently exists, especially for Sites 2 and 3, was also believed to be false, based on the experience of numerous other reservoir fisheries in Thailand, irrespective of the water quality problems that may accumulate both from agricultural activity around the reservoir and natural processes of biomass decay. Vegetation and land use are intimately linked when considering the scenarios. Each development scenario tended to stress irrigated agriculture over any need to conserve natural vegetation and as was witnessed during the dry season field visit to the sites, the rate of clearance of flooded forest was rapid and on-going. The general consensus for Sites 1 and 3 was that seasonally flooded forest was probably doomed, whether by the Business-as-Usual or the Nam Songkhram Dam route, but at Site 2 (Ban Tha Bor), there was a slight hope of villagers being able to protect some limited areas of public land under flooded forest, on the assumption that the Nam Songkhram Dam is not built. The main ongoing threat here (as with Site 1) was the growing popularity of eucalyptus plantations, which were having impacts on other livelihood sectors, including livestock grazing, fisheries and rice cultivation, and identified as having potential to cause intra-community conflict in future.

While the social links to the various livelihood activities dependent on floodplain resources were strong, ultimately it was felt by the respective specialist that there were stronger socio-economic and political drivers at work than the bio-physical driver of flow changes, that had in the past and would in the future be the more significant influence on local communities' choices and outcome. Hydrological flow, was just seen as one of several "flows" occurring in and around the communities studied, with the flow of people (migration) being a primary one to consider. Another general issue that emerged during this exercise for the socio-economist was the observation that there were differences between what he understood to be potential positive and negative impacts arising from the Scenarios and what villagers' understood. Thus, there was a tendency for confusion as to whether he should be presenting the villagers' as local stakeholders reported views and opinions, or his own interpretation of future changes.

Overall, the Scenarios Workshop was not as decisive as some may have anticipated in coming to firm conclusions about future environmental and social outcomes brought about by flow changes, which as discussed may have been a result of unrealistic expectations placed on it and the emphasis placed by the E-Flows Team Leader on quantitative data, before there was sufficient understanding of the methodology and expectations of the exercise. While this was unfortunate, it did not imply that the exercise was not useful for raising capacity and exposing the entire team to a new way of looking at the complexity of "Flows".

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E-Flows in the Nam Songkhram River Basin
David JH Blake et al
Annex 5: Multi-Stakeholder Meeting

Introduction

The E-flows approach applied in Thailand was developed based on the notion that E-Flows does not only consider the importance of river flows from a physical or ecological perspective, but also encompasses socio-political factors. The role that people play both as beneficiaries of the wider riverine ecosystem and at the same time, modifiers of the ecosystem are key to understanding E-Flows. The process of the E-flows assessment indicated that the stakeholders linked to the Songkrham Basin are multifold including, people living along the river and their extended families working as migrants in other parts of the country.

The different stakeholders represent different geopolitical conceptualisations of the Basin. The participants represented different positions in relation to water allocation or restrictions (in erms of flood prevention). Thus, the appropriate environmental flow is for the Songkhram river depend on the values for which the river system is to be managed. Those values will determine the decisions about how to balance environmental, economic and social aspirations and the uses of the river's waters.

The key component of the E-flow approach is to facilitate a negotiation between the different stakeholders on the reasonable and equitable utilisation of water in the Songkhram Basin. The multistakeholder workshop was a first attempt at a meeting between civil society, government officials and academia and community members on the roles and functions of the Songkhram River by critically reviewing the outcomes of the technical assessments in the the E-flows project.

This was in acknowledgement of the fact that although the Songkhram Basin spans four provinces, it is not at present managed as one complete unit, but rather split into six sub-basins with little coordination between these sub-units. Thus there remains a lack of a basin overview amongst key stakeholders about the nature and challenges of the Nam Songkhram Basin.

The interdisciplinary Environmental Flows work in the Songkhram River Basin was a first step in providing data and practical tools for river basin and water managers at national and local levels to apply similar approaches for better outcomes.

Objectives

1. To explore the implications of the findings of the environmental flows assessments in relation to possible development scenarios and other key research conducted on ecosystem and livelihoods in the Songkhram River Basin;
2. To discuss ways of utilising the knowledge gained during the study to ensure sustainable resources management for the Songkhram River Basin and exchanging stakeholder perspectives;
3. To explore options for advancing and building-upon the E-Flows work as a legitimate multi-stakeholder approach to basin management, both within the Nam Songkhram Basin and others in Thailand.

A senior representative from Office of Natural Resources and Environmental Policy and Planning (ONEP) greeted the participants and opened the Workshop with the following remarks:

“The Songkhram River Basin is unique and of great importance to the ecosystem (broadly defined) and to the economy, society, and culture. Its wetland is created by nature. The water connects all living things: plants, animals and human altogether. In the flood season, when water from Mekong River flows back into the Songkhram basin, almost one hundred thousand hectares of the basin are flooded. During this time, floods that spread across the floodplain bring aquatic animals and various kinds of fish into the area, bringing balance and fertility to the area. During the flood season, many species of fish use the Basin and its flooded forest areas to feed, reproduce, and reside . . . Mekong River Commission data estimate that villages catch more than twenty thousand tonnes of fish per year.

“The wet season is best for villagers to catch fish, while the land is used for farming rice when water levels decline. As well, natural vegetation in the seasonally flooded forest is a source of food, herbal medicine, wood for building and repairing homes. . . . . These things are natural capital, which we sometimes overlook or destroy. There is also immensely valuable biodiversity, which may have already been lost through lack of awareness or understanding, or else with good intentions but lack of thorough study. . . .

“The challenge is how can these limited and declining natural resources be managed and how knowledge and participatory management can be effectively applied. A continuous stream of research, experiment, learning, and sharing of knowledge and experience is required.

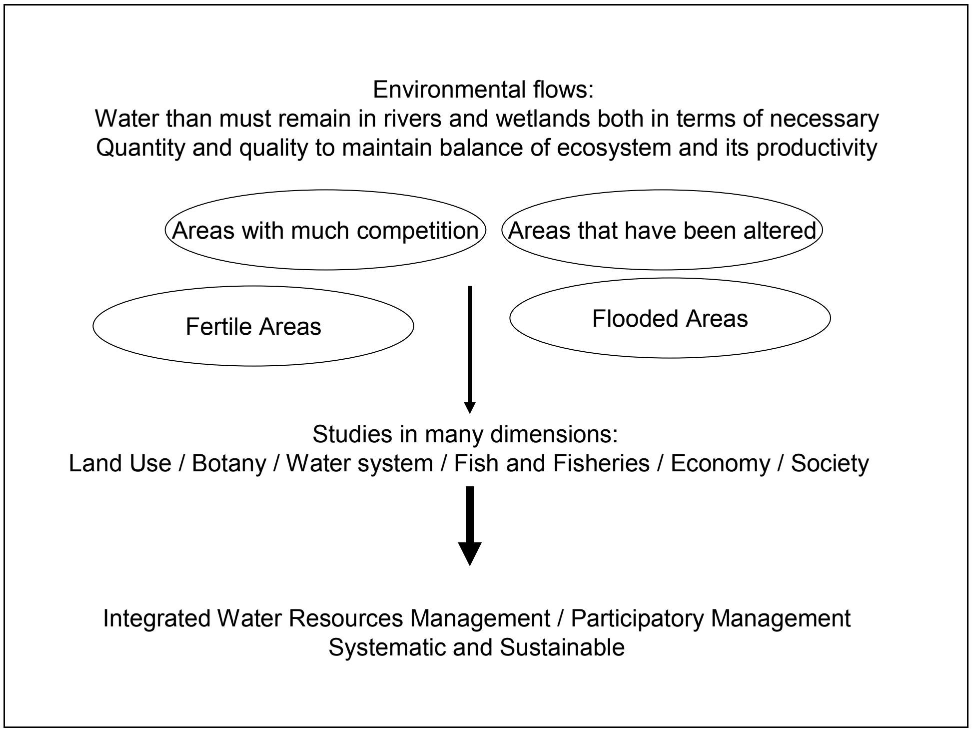
“The Workshop, therefore, creates an important opportunity for representatives of the four provinces the Songkhram River flows through, to look at the Basin as a whole and to use knowledge from the study in joint decision making, by using principles of wise and sustainable use.”

Introduction to Environmental Flows

Participants from the Provincial Natural Resources and Environment Office, Nakhon Phanom enquired whether the concept is mainly about water. The presenters agreed, saying that environmental flows work in the Songkhram uses water as the central issue, as it links to vegetation, animals, land use and a variety of activities.

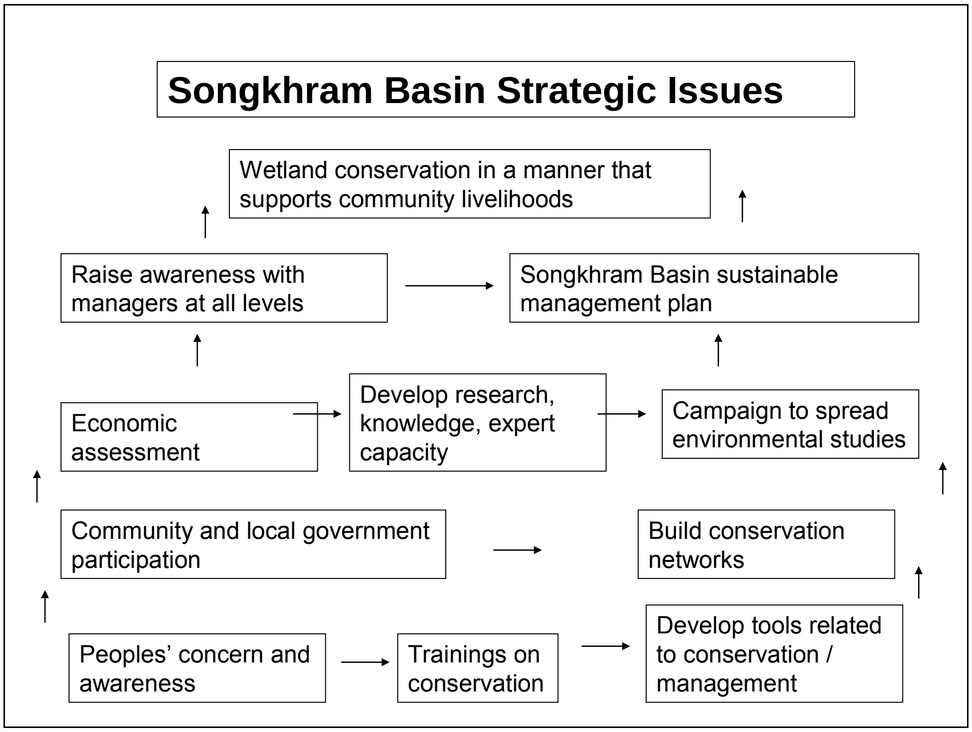
Following the presentation of key findings from the pilot EFA, the Workshop facilitator presented his assessment of the environmental flows concept (Figures 1–2).

Figure 1 An Interpretation of Environmental Flows for the Nam Songkhram River Basin



Note: areas with competition refer to areas experiencing conflicting claims, e.g, between wetland areas traditionally recognized as common property, vs. recognized by the state as private once reclaimed for beneficial use. See Blake and Pitakthepsombat (2006: 63).

Figure 2 Strategic Issues for the Songkhram River Basin



Plenary discussion between participants and study team experts

In this session the Environmental Flows Assessment Study team took turns answering questions from participants.

Question: Is environmental flows a new tool or an innovation for more integrated water management?

Answer (by hydrologist): E-Flows is not a blueprint in fixing and managing water in a completely integrated way. In fact, it is an attempt to study and understand the condition of ecosystems in headwater areas, middle reaches and lower reaches using connections involving the dynamics of water (water quantity, movement and quality). These studies can lead to more effective project design and planning.

Question: What should be done in order to ensure an appropriate quantity of water?

Answer: (by hydrologist): Important considerations are first, increasing water storage by improving reservoirs, weir and dikes, through projects with limited ecological damage, and which have no conflict with local people over resource use. Appropriate methods to improve small-scale water resources include dredging up ditches, canals and swamps.

When diverting water, it is necessary to consider the distance, the cost, and all dimensions of impacts. This should be done in a process that meets civil society approval.

A civil society representative from Sakhon Nakhon gave further suggestions for water management: first, upper basin areas must be included in sustainable water management. Next, environmental flows studies must be conducted with appropriate understanding of local forest and vegetation conditions, and consideration of appropriate weir and dike design.

Question: How can civil society participate in botanical studies?

Answer (by botanist): Our studies show how vegetation growing around the riverbank is connected to local livelihoods. These vegetations are for example: bamboo species, *pak som, pak khom, pak boong* (*Ipomoea aquatica*), *krai hang naak* (*Phyllanthus taxodiifolius*), and *kradon* (*Barringtonia acutangula*). [*add other Latin names if known]

The plants are used by local people and contribute to local self-sufficiency. These plants are dependent on annual floods inundating the area for periods of time. If wetland areas are turned into reservoirs, such plants will not survive. If wetland areas are dried out, the plants will not survive and not be able to spread their seeds and germinate. This shows the importance of the flood cycle to sustain the unique floodplain ecosystem.

Question: What causes changes in the ecosystem, such as the disappearance of fish habitat and fish species?

Answer (by fisheries specialist): Fish that remain in backwaters during the dry season will breed during the next season. However, if productive backswamps are auctioned off for harvest, all big and small fish will be caught. Dredging projects will cause fish to die out. Some species of local fish have disappeared because the environment in the basin has changed. Schools of big fish are harder to find.

In low flow periods it can be easier to catch fish, leading to more exploitation. Fresh fish caught are sufficient for consumption, but not enough to preserve as *pla som*[1] and therefore extra fish have to be imported from outside the basin [to satisfy demand].

Additionally, seasonally flooded forests have been cleared for eucalyptus plantations to supply the pulp and paper industry. Eucalyptus has impacts on fish habitat as it has been observed that fish rarely inhabit areas where eucalyptus grows.

Comment from a Sakhon Nakon civil society participant: The E-Flows study as presented has not been conducted in depth. Aspects of civil society participation, policies affecting the ecosystem (proposed by the state, business and politicians) have not been explored.

[1] *Pla som* are whole fish preserved by fermentation using garlic and rice, and regarded as a local delicacy.

The study has also not done any economic valuation. For example, when flooded forest areas are converted to eucalyptus, it is possible to value the latter. However, what is the value of the former? Without environmental valuation, the study is not so different from Tai Baan Research. These missing components are relevant to how knowledge gathered can be used in decision making and planning.

Answers (by socio-economist and civil society participant): We deliberately avoided the trap of valuing the ecosystem by reference to market prices. It is necessary to take a long term perspective and to think in terms of total economic value. The business sector is supporting growing eucalyptus which causes two major outcomes: farmers are increasingly motivated by cash income, while demanding government compensation when flood damage occurs. Policies that support rubber growing will in the long run also have an impact on rural labor and local culture.

Additional Remarks

A civil society representative: Water management should observe lessons from local knowledge and invest in irrigation systems and small reservoirs that are of net benefit. In the upper Songkhram Basin there are big water diversion projects under way. Studies and policy recommendations should be presented to the public.

A university lecturer involved with the study team: E-Flows studies still lack historical depth, such as the development of civilization in the Basin. People traditionally caught fish for consumption and they could adapt their livelihoods to the local environment. The natural fertility brought Tai Krua people to migrate to the area and settle down permanently. Farmers grow double-crop rice for selling. Now there is widespread purchases of items like tractors and water pumps which destroy traditional livelihoods.

Plenary: Summary remarks by study team experts

The environmental flows expert stated that E-Flows studies have given stakeholders in the Basin a better understanding about the floodplain ecosystem and the condition of natural resources.

The fisheries expert said that traditional fishing practices are suited to local ways of life. A government fisheries expert however added a strong concern that the practice of auctioning harvest rights to wetland bodies was illegal and very destructive. Better fisheries management was needed. The hydrologist noted that upstream Mekong River projects may not change downstream flow volumes, but some of these projects – e.g., the MRC's "high development" scenario – will affect sediment dynamics and fisheries productivity.

The land use expert affirmed that communities have learnt how changing conditions affect production and this could lead to a way to develop tools conforming to local government planning. The social scientist stated that the environmental flows pilot study raises three issues of relevance to the provincial governors. First, in light of the study findings, can decision makers re-evaluate their development priorities? Second, can existing policy processes and mechanisms be improved? Finally, the environmental flows approach is valuable not as a source of final conclusions to be presented to decision-making, but as an input to multi-stakeholder meeting.

Contrasting development scenarios

The presentation of key findings and plenary session discussion was followed by a two-hour small group discussion based on two contrasting development scenarios for the Songkhram River Basin. Prior to the 21 May Workshop, a discussion paper (see Section 4) had been compiled and distributed featuring four alternative development scenarios. The scenarios in that paper were based on:

1. Generally known issues and trends in the Songkhram Basin, from background information and implementation of MWBP Demonstration Site project 2004–07;
2. Projects long-proposed by key water stakeholders, which periodically emerge as being favourable options, and have been raised in the last two years for possible future implementation;
3. Non-mega project options which could be put forward as alternative sustainable development pathways.

During the small group meeting, participants were asked to discuss two scenarios:

(1) Business as Usual and (2) New Dams.

“Business as Usual” was defined as extrapolation of current socio-economic and development trends. The New Dams scenario could include any projects proposed or already underway in the Basin which participants were aware of.

In the lower Basin, two important projects that have been proposed are: the Nam Songkhram Dam on the mainstream, and a five-meter high weir with slide gates on the Nam Oon tributary.

The Nam Songkhram was first proposed in the early 1980s. After local opposition (including by some groups present at the 21 May Workshop) it was rejected in 2002 by the Cabinet under former PM Thaksin Shinawatra. However, it was raised again by PM Thaksin during a wet season visit to the Basin in late 2005 (Blake and Pitakthepsombut, 2006b).

The smaller Nam Oon Water Gate was the subject of a public hearing in March 2006. Some observers regard the Nam Oon project as more attractive to the current military- appointed administration.

For each scenario, groups were asked to discuss the current situation, including problems in different dimensions, and to offer clear approaches to solve or mitigate those problems.

Scenario 1 – Business as Usual

From the small group discussion, a composite picture of agricultural commercialization, land ownership concentration, and stress on wetland ecosystems emerged.

More people from outside the community have entered, use local resources and occupy land. Patterns in agriculture, production and fishing have changed. Government policy supports rubber growing and turning natural assets, including common property, into capital. The labor-intensive practice of growing rice transplanted rice changing to broadcast rice seed will continue. Migration to take up off-farm employment will continue, along with changes in values and livelihoods. Lack of systematic land use zoning and control will continue.

In ten years time, participants expected natural resources, including common property resources to be degraded through land use change and intrusion. The population will derive income from wage labor (administrative work and manual labor). Urban areas will increase in density. Land will be bought by capitalists (*nai toon*) with higher competition for land as a resource. Farmers will increasingly turn to rubber and eucalyptus plantations.

In terms of water resources, participants expected more reservoirs, weir, dikes and dams will be constructed and developed, promoted by government policy. River mouths will be more polluted. Water quality will be worse. Water from outside the community will be used instead. Wild capture fish and natural food will vanish, as illegal fishing continues. Instead, fish will be increasingly cultured not caught. *Paa boong paa thaam* will deteriorate. Pollution and conflicts will occur in communities.

Participants expressed concern about villagers' lack of knowledge about changing ecosystems and the changing context. At the same time, they were concerned that local government representatives focus too much on solutions involving new infrastructure projects. (Such projects offer opportunities for construction contractors to bid on the work and can be lucrative.)

In terms of prevention and mitigation, solutions offered were as follows:

1. Summarize lessons learnt, including those from relevant government sectors;
2. Develop strong networks and communities in supporting preservation;
3. Support shared values in preserving one's locality (for both people inside and outside the community) and the uniqueness of Nam Songkhram Basin;
4. Preserve and restore *paa boong paa thaam* and maintain publically owned land;
5. Preserve local fishing practices and fish processing methods which have long been a part of community culture;
6. Maintain water quality and quantity in line with natural ecological conditions;
7. Raise awareness amongst young people and integrate conservation lessons into all levels of education.

Scenario 2 – Songkhram Dam and Nam Oon water gate

Under this scenario, the overall composite picture was very similar to that of Business as Usual, except that more rapid ecological degradation was expected to occur.

Specifically, fish migration was expected to be blocked. Reduction of biodiversity was expected due to loss of floodplain areas. Water quality was expected to deteriorate, for example with increasing soil salinization and biological oxygen demand. Traditional livelihoods in the floodplain would change: wild capture fishing and livestock grazing on common land would decline. Social conflicts were expected to increase.

A number of benefits were considered possible. For example, fish more tolerant of still water might take the place of migratory fishes. Some farmers might be better able to grow a dry season rice crop, especially in areas serviced by dams. However, along with such intensification, some participants expected increasing perceptions of drought by farmers in the future. That is, the more farmers come to rely on dry season irrigation, the more they will perceive any shortage of it as a "drought."

In terms of prevention and mitigation, solutions offered were as follows:

1. Make all information and policies regarding dam and reservoir projects more transparent;
2. Study the impacts and link them to social learning;
3. Develop small irrigation projects where communities take part in management;
4. Set systematic water management plans, including cooperation with DWR and other relevant departments;
5. At the local level, village water committees should continuously follow-up on and resolve problems.
6.

Plenary session: Visioning a more sustainable future for the Basin

Within the next 10 years, Workshop participants expect continued impacts of modernization and agrarian transition. Livelihoods of communities in the Basin will change, land will be consolidated by capitalists (nai thun), wetland forests and environmental quality will deteriorate. There will be more economic competition, conflict, and inequity in society.

In a plenary session, groups were invited to present their sustainable development visions for the Basin. One vision that captured the imagination of the participants was that the Basin could be an amazing place with a world-class reputation as a desirable destination. Such a vision might have:

> A temporary freshwater inland lake of more than 500,000 rai in the wet season filled with tasty, native fish. These would be caught by sustainable methods. There will be opportunities to learn about the livelihood of basin communities, with access to learning centers for study of nature and culture. Villagers preserve their local environment and traditional values. A small-scale irrigation network exists that is jointly managed by communities. A strong civil society exists and state agencies accept the lessons of past development mistakes.

Participants were invited to individually brainstorm and write down key measures or development approaches they thought appropriate and realistic. Not surprisingly, when viewed together, not all suggestions offered appear to present a coherent vision. Some participants for instance suggested continued support for dry season rice cultivation, which implies increased agricultural intensification, while on the other hand, several suggestions were made to “conserve” natural habitats and customary livelihoods, implying a de-intensification of agriculture for floodplain ecosystem restoration.

In terms of governance, suggestions made include integrated planning at the basin scale down to the local level, including strengthening the role and capacity of local governments to integrate or adapt central policies.

It is clear from the discussion and written suggestions that environmental flows approaches were accepted by the participants as having a role to play in integrated basin management. Participants recognized that an environmental flows approach was an improved method of water management, and they suggested more channels and venues for people to learn about environmental flows.

Improved management of the Songkhram River Basin

Following the scenario activity and discussion, IUCN representative Mr. Tawatchai Rattanasorn presented a draft proposal to establish a “four province [inter-provincial] working group” to Workshop participants. The working group would seek to deliver more integrated river basin management.

Some participants considered a new organization at this level was not yet needed, but rather felt that this kind of work should begin at the district level. Others disagreed, saying that for Nakhon Panom, the most downstream province, problems were acute and that Nakhon Panom was ready to take a leadership role in conservation and wetland management. Others suggested that at present, a provincial level administrative structure is more clear and efficient than an inter-provincial structure.

No conclusion was reached on the issue of whether the new organization should be initially established at the provincial level (one for each province) or the inter-provincial level. The issue will be discussed at a final workshop on 26–27 June 2007.

PN67_2010_11
Nam Songkhram Basin, NE Thailand: Place & Arena Study

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I Summary

The Nam Songkhram Basin in Northeast Thailand has a history of natural resources contestation and environmental degradation stretching back over five decades, which has to a significant extent revolved around water management policy and practice. It has been a site of multi-stakeholder conflict and local resistance that has transcended the geographical limits of the Basin to involve diverse actors, interests and discourses at the national, regional and international level. Integral to the far-reaching social and environmental transformations that have occurred over this time has been a fundamental shift from predominantly common property to private property regimes which, it is argued, has had complex consequences on the way that various actors regard and manage the Basin and its resource base. While certain state agencies still work towards enabling large-scale irrigation projects, some involving trans-basin and trans-national water transfer schemes; other agencies (state and non-state organizations) nominally seek to protect parts of the lower basin wetlands as a conservation area of international standing (e.g. proposals for it to become a Ramsar Site) and yet others call for less top-down official and state-backed projects, but more empowerment and recognition of local communities' resource management practices. This report examines the complex background to natural resources management and water governance in the Nam Songkhram Basin, before training the analytical lens on a number of key case studies to illustrate the conflicting worldviews and approaches to development. Some of the main drivers underpinning water resources management decision-making, along with the web of consequences stemming from them are examined, especially with regards to wetlands ecosystems.

II Location

Overview

The Nam Songkhram Basin occupies an area of 13,128 km^2 and is the second largest basin in Thailand's Northeast region, known as *Isaan,* behind the much larger Chi-Mun Basin (117,000 km^2) (see Box 1). It is situated in the far northeast corner of Isaan in an area bounded to the south by the Phu Phan hill range that divides the Nam Songkhram Basin from the Khorat Plateau and to the north and east by low sandstone hills beyond which lie the broad arch of the Mekong mainstream and Lao PDR beyond. The Nam Songkhram River, rises at an altitude of about 400 masl along the western slopes of the Phu Phan range and flows approximately 495 kms[1] to enter the Mekong River in Tha Utaen District of Nakhon Phanom Province. The Nam Songkhram River is characterized over most of its course by gentle gradients, slow flows and a meandering channel, with the lower 250 kms or so flowing across a broad riverine floodplain wetland landscape, mostly lying 140 – 150 masl. The floodplain exhibits a range of topographical features and habitats - some natural, some artificial.

The Nam Songkhram Basin encompasses parts of four provinces, namely Sakhon Nakhon, Udon Thani, Nong Khai and Nakhon Phanom, having a population thought to be around 1.45 million[2] (Blake, 2006). The Nam Songkhram River has several significant tributaries, with the Nam Oon and Nam Yam rivers entering from the south and Huay Khong, Nam Hee and Nam Mao rivers entering from the north of the basin. Regarding climate, the Nam Songkhram Basin occupies one of the wettest parts of the Northeast, a region that has long been popularly typified as the driest and poorest in Thailand, often with little qualification or intra-regional differentiation.

The northern parts of the basin receives far more precipitation than the southern parts, with an approximate gradient running from south to north, from about 1,200 mm/annum in the Phu Phan hills rain shadow (e.g. Warit Chaphum and Sawang Daendin Districts of Sakhon Nakhon Province) up to 2,900 mm/annum in Bung Kan District, Nong Khai Province bordering the Mekong. It should also be noted that as well as variation in rainfall across the Basin, there is also significant inter-annual variations in rainfall are experienced in Northeast Thailand. This marked variation in annual rainfall is of significance to the ecology, hydrology and agricultural potential of different parts of the Nam Songkhram Basin.

The bio-physical landscape of the Nam Songkhram Basin varies from thickly forested hill slopes of the Phu Phan range to wide, open lowland floodplains and diverse wetland habitats of the Lower Songkhram River Basin (LSRB). In between there are

Box 1: Nam Songkhram Basin - Facts at a Glance

Total Basin area	13,128 km^2
Total river length	495 km
Altitude at source	Approx. 400 m asl
Altitude at confluence with Mekong	Approx. 135 m asl
Mean annual flow	300 m^3/s
Total annual run-off	7,977 MCM
Area of permanent surface water (in LSRB)	116 km^2
Area of annual flooding (mean for LSRB)	960 km^2
Average mean precipitation in Basin	1,200 – 2,900 mm
Annual evaporation rates	1,558 – 2,054 mm
Min/Max Temperature range	4 ^{0}C – 42 ^{0}C

90 % of annual rainfall occurs between May – October; with a dry, cool season extending from November – February. March – April are marked by high temperatures and evapo-transipiration with occasional intense thunderstorms and strong winds.

a range of different landscapes, most showing strong anthropomorphic influence resulting from almost complete agricultural conversion of the original forest cover over the last five decades or so. Although estimates vary, it is thought that remaining forest covers only 12-15 % of the total land area much of it heavily degraded (Blake and Pitakthepsombut, 2006); with a growing proportion of the total cover now converted to industrial monocrop plantation forest, rather than natural

Box 2.Seasonally flooded forest habitat (*paa boong paa thaam*)

The Lower Nam Songkhram Basin is one of the last sites in Thailand still retaining some seasonally flooded forests, even though it is much degraded and reduced in size from just a few decades ago. Known to local people as "*paa boong paa thaam"*, these forest areas are actually a complex of wetland habitats, containing a range of vegetation types and landscape features that are in a state of flux between terrestrial and aquatic environments, depending on the season. In the peak rainy season they may be inundated by up to five metres of water, with only the tops of fast growing bamboo species and larger trees and shrubs emerging from the surface; while in the dry season the soils may dessicate and plants may shed foliage for 3-5 months. Hence, the natural vegetation has evolved and adapted to cope with hydrological and climatalogical extremes. They are sites of rich and varied biodiversity, both plant and animal, aquatic and terrestrial, and as such are important locations for local people to harvest a wide array of common pool resources and benefit from numerous ecosystem services these wetlands provide. They have been metaphorically compared with "kidneys" or as "wombs of the landscape", in reference to their water cleansing and productive properties respectively, and due to their largely open access nature could be viewed as social security for a large segment of the local population who can gain food and income from these wetland habitats with very little investment required. Increasingly though, as these habitats have come under pressure from local and external threats which have seen the vast majority turned into rice fields, eucalyptus plantations or privatized by agribusiness companies for intensive cash crops, local villagers have tried to conserve and protect some of the last remaining pockets, partly by introducing new rules and regulations governing their exploitation. Despite this, local conflicts for land and natural resources abound and up to 2007, many small pockets of *paa boong paa thaam* were still being cleared and burned for expansion of the agricultural frontier.

vegetation habitats. Much of the original forest has been fragmented into small pockets, which in many cases are continually being lost to agricultural conversion, both on the upland, terraced areas where rubber and cash crops predominate and the lowland floodplains where paddy and eucalyptus plantations predominate. One study estimated that 54 % of the entire Nam Songkhram Basin could be classified as "wetlands" according to the Ramsar definition, of which the main category by far was wet rice fields (38%) (Sombutputorn, 1998).

In the LSRB, the floodplains and surrounding low-lying alluvial terraces are dominated by wetlands habitats in an advanced state of conversion to agricultural uses and the agricultural frontier is near to reaching its terminal limit. Hortle and Suntornratana (2008) calculated that 88.7 % of the LSRB can be classified as wetlands habitats. One GIS-based study across 739 km^2 of LSRB between 1989 to 1998 found that various forest categories had declined between 35 – 71 %, while "water resources" (mostly referring to reservoirs) had increased by 111 % in terms of surface area (Chutiratanaphan and Patanakanok, 2001). Surprisingly, "idle land" increased by 21 % during the same period, but field crops and paddy increased by only 14 % and 2 % respectively, suggesting that the water resource increase had not been well utilized for agricultural purposes. The most recent remote sensing assessment of the ecologically important seasonally-flooded forest (locally known as *paa boong paa thaam* – see Box 2) estimated that in 2005 only about 73 km^2 remained in scattered pockets along the lower river floodplain (Suwanwerakamtorn et al, 2007).

The floodplain wetlands today form a mosaic of paddy fields, disturbed scrub and bamboo forest, small patches of fertile evergreen forest, eucalyptus plantations, open grassy plains, marshes and swamps, reservoirs and other water bodies, human settlements all intersected by a large number of water courses. This distinction between terrestrial and aquatic landscapes becomes blurred in the wet season between July and October, when large swathes of the entire LSRB are inundated under a shallow lake and the human settlements are left stranded on small peninsulas and islands just above the waterline. In the average year, 96,000 ha or 31 % of the entire LSRB are inundated, while in a 1 in 50 year flood about 60 % would be flooded. Seasonal inundation and flooding are an integral part of the Nam Songkhram's water landscape or perhaps more accurately "waterscape", following (Swyngedouw 1999). For more detailed description of the geography and ecology of the Nam Songkhram Basin, refer to Blake and Pitakthepsombut, 2006a and Blake, 2006.

A Flood Pulse system

An understanding of the hydrological regime and its relationship with other parts of the ecosystem is crucial to gaining an understanding of the development potential and constraints of the region. The Nam Songkhram River is subject to a pronounced seasonal variation in flows, closely mirroring the rainfall pattern, with minimum dry season discharge approximately less than 1% of wet season maximums. The average monthly discharge at Ban Tha Kok Daeng (approx 150 kms from Mekong confluence) is over 800 m^3/s in Aug-Sept, decreasing to less than 20 m^3/s for the entire January to April period (MRCS/WUP-FIN, 2005). Minimum flow discharge at Ban Kok Daeng is between 0.5 m^3/s – 2.0 m^3/s at the tail end of the dry season. Water levels between the seasonal minimum and maximum may change by 12-14 m in height, with riverbanks overtopped and the floodplain inundated for 2-4 months. This impressive seasonal variation in flows found in certain tropical rivers is sometimes referred to as the "flood pulse" concept (see Junk et al., 1989; Junk and Wantzen, 2004) and is considered the underlying basis of the biological productivity in the Mekong Basin's floodplains (e.g. MRCS/WUP-FIN, 2007). The flood pulse concept refers not only to the hydrological event of flooding, but incorporates the dynamic process of exchange of water, nutrients and organisms between the river and its connected floodplain (Lamberts and Bonheur, 2007).

In the lower hundred and twenty kilometres or so of the Nam Songkhram's course during the wet season there may be a pronounced backwater effect and occasionally, a backflow effect with water from the Mekong River flowing upstream and spilling on to the floodplain, similar to the phenomenon experienced by the Tonle Sap River and Great Lake of Cambodia (e.g. Lamberts and Bonheur, 2007). Recent studies conducted for the MRC's Water Utilization Programme by MRCS/WUP-FIN (2007a and 2007b) have confirmed earlier views (e.g. NEDECO/TEAM, 1983) that, "The Mekong water level is the main factor defining the flood behavior in [the] lower Songkhram River and the impact of local upstream flood control on flooding would be negligible."

Hence, the study of bio-physical inter-relationships between the Nam Songkhram and Mekong rivers is fundamental to further understanding the dynamics of each basin. If the two rivers are closely inter-dependent for ecological functions and services as hypothesized, then what happens to one will likely affect the ecological health of the other to some degree. In other words, degradation of one river system will impact on the ecosystem services provided by the other's wetlands, including provisioning services (e.g. food and water); regulating services (e.g. regulation of floods, drought and pollution); supporting services (e.g. nutrient recycling and soil formation); and cultural services (e.g. recreational, spiritual and religious benefits) (Millenium Ecosystem Assessment, 2005).

Comparisons with the Tonle Sap system, Cambodia

Several observers have made comparisons between the Lower Nam Songkhram River Basin and the Tonle Sap system in Cambodia, the validity of which are briefly examined here. For example, Blake (2006) noted that, "Flooding in the LSRB is a function of both in-basin precipitation and ambient river levels of the mainstream Mekong River. The latter in many ways of a micro-version of well-known hydrodynamic phenomenon that occurs annually on the Tonle Sap and Great Lake in Cambodia." He pointed out that there is both a backwater effect and an occasional reverse flow influencing the frequency, height, duration and extent of flooding in the LSRB floodplain. The MRC/WUP-FIN (2005) study using computational modeling confirmed that a backflow effect occurs to some extent nearly every year and in some years may occur four or five times, with July being the most common month for reverse flow to occur. During large reverse flow events such as July 1997, the mainstream Mekong water will reach the floodplain over a wide area upstream of Sri Songkhram township (67 kms from river mouth), inevitably carrying with it sediments and nutrients from the Mekong. According to Khon Kaen University (1997), in 1978 the backflow lasted for four days (15 – 18 August) and an estimated 243.9 MCM of water flowed back into the Nam Songkhram channel from the Mekong, due to the height differential between the two river levels. Blake (2006) compared the wet season maximum and dry season minimum water surface areas between the lower Nam Songkhram and Tonle Sap systems, and found that the ratio between the two was proportionately greater in the former, as shown in Table 1 below.

Apart from the hydrological similarities there are other parallels to be drawn between the two Mekong sub-basins. As mentioned earlier, they are both flood-pulsed ecosystems with intimate linkages between the productivity of the ecosystem and the flow of the mainstream Mekong (see Lamberts and Koponen, 2008). While it is unlikely that most of the water contributing to the Nam Songkhram flood pulse has originated from the Mekong River, as estimated to occur in Tonle Sap Lake by MRC/WUP-FIN's (2006) models, there are still close eco-hydrological linkages between the two, including regular passive and active exchange of biological organisms. As several studies have pointed out, much of the Lower Nam Songkhram's fisheries are based on migrations of fish from the mainstream Mekong (e.g. Suntornratana et al, 2002; Tai Baan Research Network of Lower Songkhram Basin, 2005b; Hortle and Suntornratana, 2008).

Clearly both locations have a high proportion of the local population who rely directly or indirectly on the ecosystem services provided by the wetlands. The productive and biodiverse fisheries are probably at the forefront of the provisioning services and while it is estimated that 80 – 93 % of households fish part-time in the LSRB and the estimated mean household catch is 207 kg/year (Hortle and Suntornratana, 2008), the figures in the Tonle Sap fishery are proportionately higher, befitting its much grander scale and greater productivity. Hortle (2007) citing a study from Ahmed et al, (1998), reported that fishing communes in the eight provinces surrounding Tonle Sap caught on average about 83 kg/ha/year and 99 % of surveyed households were involved in family-scale fishing.

Table 1. Comparison of dry and wet season water surface areas and ratio between these two extremes for Lower Nam Songkhram Basin and Tonle Sap Lakes.

Parameter	Lower Nam Songkhram Basin, Thailand (km^2)	Tonle Sap Lake, Cambodia (km^2)
Dry season surface water area	116	2,500
Wet season surface water area	960	15,000
Ratio of dry : wet season areas	1 : 8.3	1 : 6

(Source: Blake, 2006)

Other similarities are the presence of a fringing riparian forest rich in biodiversity at both locations, referred as a seasonally-flooded forest in the LSRB and gallery forest (e.g. Kummu & Sarkulla, 2008), which are both threatened by local over-exploitation and external environmental causes, including changes in hydrological regime. As Kummu and Sarkulla (2008:185) stated: “Relatively small rises in the dry season lake water level would permanently inundate disproportionately large areas of floodplain, rendering it inaccessible to floodplain vegetation and eroding the productivity basis of the ecosystem.” By the same token, relatively small changes in wet season flood levels, will greatly reduce accessible aquatic habitat for fish and living aquatic resources at both locations.

Both floodplain ecosystems are highly sensitive to changes in the Mekong’s hydrology, especially alterations to flows and sediment regimes caused by upstream hydropower developments. While narratives surrounding droughts and floods as the main problems have dominated mainstream development thinking for decades, there is now more recognition of the importance of natural hydrological regimes for maintaining ecosystem productivity in the Mekong Basin which underlies livelihoods for hundreds of thousands of households in the Lower Mekong countries.

III Focal Water Allocation Issue/s of the Place

The Nam Songkhram Basin has played a peripheral, but important, role in the water management planning, practice and conflict that has characterized Northeast Thailand’s development discourse over the past four decades. It is recognized by some as a site of rich fisheries, fertile wetlands, surviving local resources-based livelihoods and has been portrayed as the “last undammed river in Thailand” (e.g. Breukers, 1998:27; Sasaki et al., 2007), while others may associate it as a place where a major dam project was halted by the combined resistance struggle of civil society, academics and local people in the late 1990s (e.g. Lohmann, 1998). Being relatively remote and distant from the main centres of population and power in Thailand has acted both in favour and against it in terms of the degree to which mainstream development initiatives have transformed the landscape. On the one hand, there are no large conurbations within the Basin or immediately surrounding it demanding large volumes of water for domestic or industrial use, while on the other hand its remoteness and apparent “underdevelopment” has encouraged a popular view with some that it is a fertile, wilderness area crying out for agricultural development and intensification (Watershed, 1996). Its position as a site of rich natural resources (wetlands and forest) and an agricultural frontier with plentiful and cheaply available land contributed to it becoming a favoured site for in-migration, a factor which led to increasing demands by state agencies, international development agencies and many of the incomers themselves for irrigation services, based largely on the popular pan-Isaan notion of seasonal water scarcity being the principle cause of poverty.

The Songkhram Basin can be characterized as being typical of other Mekong sub-basins in some respects (in terms of local livelihoods, geographical context and state-led development approach applied), while in other ways in could be considered as being quite unique (in terms of the prominence of wetland ecosystems, degree of connectivity with the Mekong mainstream and resistance of local people to the dominant development paradigm which led to the derailment of a major irrigation infrastructure project a decade ago). These examples hint at the complex nature of the ecosystem and livelihood relationships, which do not easily fit into simple descriptive summaries, but vary spatially, temporally and according to the epistemological approach one cares to adopt.

In this section, the author focuses on a few key water-allocation case studies and examines the salient details of each in a broadbrush approach, placing it in the wider context of the Songkhram Basin. By describing the key initiatives and decisions related to water allocation in each case study, it may assist the reader in relating the Songkhram Basin's development trajectory to other processes and events occurring further afield in neighbouring countries under varying governance regimes. In particular, the section is interested in exploring how the decisions were made and who were the key actors or agents? The degree to which these actors represent or reflect the local population's interests or aspirations will also be considered.

Case 1: Nam Songkhram Project & Nam Oon Watergates Project (irrigation/flood control)

Simply called the "Nam Songkhram Project", this state-led project was an ambitious wide-reaching irrigation scheme that sought to transform the physical landscape of much of the lower Songkhram River Basin (see Box 3). Although its ideological roots stretch back to the even more ambitious water management schemes proposed by the US in the late 1950s and 1960s for the Lower Mekong Basin, especially that part of the Basin lying in Northeast Thailand (see Breukers, 1998; Sneddon, 2003; Floch et al, 2007; Molle and Floch, 2008). Grandiose schemes involving building a cascade of dams along the mainstream Mekong for the purpose of providing hydropower and diverting irrigation water to the "impoverished Northeast" were proposed, using such American precedents as the Colorado and Tennessee River Basins as models (Molle et al, 2009).

Studies carried out by the US Bureau of Reclamation (USBR) through the auspices of the Mekong Committee were central to this vision,that was apparently eagerly adopted by the government of Thailand of the time and the majority of administrations ever since (Floch et al., 2007).

The Nam Songkhram Project was adopted in parallel with the much larger Khong-Chi-Mun Project by the young Department for Energy Development and Promotion (DEDP), under the Ministry of Science, Technology and Environment (MoSTE). It had evolved out of earlier plans for a large irrigation project on the Nam Songkhram floodplain, designed by a pair of consultancy companies employed in the early 1980s by the Interim Committee for Coordination of Investigations of the Lower Mekong Basin, financed by the Royal Netherlands Government (NEDECO / TEAM, 1983).

Like the earlier army planned and implemented “Green Isaan Project” (see Floch et al, 2007), the Khong-Chi-Mun Project and the Nam Songkhram Project were all based on the assumption that the main “problems” holding back agricultural development and causing poverty in the Northeast were annual drought and floods, with the main “solution” being construction of large-scale water infrastructure projects to tame the unruly rivers and deliver water to farmers’ fields everywhere (Breukers, 1998; Blake, 2006; Blake et al, 2009). A narrative based on chronic water scarcity was central to providing a meta-justification by the state for these projects, similar to that provided in other Asian countries, such as the case of Kutch District,

Box 3. Nam Songkhram Project – key details

Type of Project: multi-purpose irrigation and flood control

Dam type: water regulator constructed on lower Nam Songkhram, 5 kms from Mekong confluence

Dam specifications: 15 m high concrete structure, 350 m wide, 5 liftable water gates (double leaf gates - based on similar design used for Khong-Chi-Mun Project)

Annual discharge at dam site: 8,681 MCM/year

Reservoir area: 255 km^2

Storage volume: 350 MCM (at 139.5 masl max water level)

Planned irrigated area (in two phases): 565,000 rai (90,400 ha)

No. of electric pumping stations to be built: 47

Expected construction cost (in 1997): 10,366 million baht (US$ 414.64 million)

Note that subsequent phases building several more dams on tributaries would add a further 351,600 rai (56,256 ha) of irrigated land costing 6,164 million baht (US4 246.56 million). It was envisaged that this entire project would be paid for out of the national budget with an EIRR of 15.24 %.

(Source: Khon Kaen University, 1997)

Gujarat Province, India studied by Mehta (2001). Another central tenet to the dominant scarcity narrative is that water run-off that flows unchecked in rivers (into the Mekong or the sea) and not impounded in reservoirs is somehow wasted and lost for benefit of the nation. Hence, a key figure frequently quoted by state agencies as if it is a direct indicator of development itself, is the storage volume. Hence, it was stated in the 1997 Environmental Mitigation Plan for the Nam Songkhram Project prepared by Khon Kaen University that the storage volume of large and medium irrigation reservoir projects in the Nam Songkhram Basin was 568 million cubic metres (MCM) theoretically irrigating 274,200 rai (43,872 ha) (p.2-5), an amount that was considered insufficient by DEDP to meet irrigation demands.

Once adopted by DEDP for implementation with a planned budget in 1995 of 10 billion baht ($400 million), the Nam Songkhram Project slowly moved forward, subject to a series of studies mandatory under law, including the newly-introduced 1992 Environment Law, which required large infrastructure projects to conduct Environmental Impact Assessments (EIAs). The first EIA for the Nam Songkhram Project was carried out in 1993 by consultant firms AEC, PALCON and Sir William

Halcrow and Partners from Britain, who were also employed on the Khong-Chi-Mun Project. However, this EIA was subsequently rejected by the National Environment Board (NEB) in 1994 as apparently it had just been copied from an earlier EIA submitted for the Khong-Chi-Mun Project according to Breukers, 1998.

The NEB recommended that the project scale down the height of the dam to create a smaller reservoir that would only store water within the Nam Songkhram's channel and provide "water for consumption only" (Breukers, 1998:28). This reduction in dam height would seriously compromise its storage capacity for irrigation purposes, an obstacle which did not apparently concern the developers who pressed on regardless with the project. DEDP subsequently hired a team from Khon Kaen University to carry out new EIA and environmental mitigation plans, which despite numerous flaws and inherent weaknesses in this type of report, did include results from a detailed study on the impacts of the project on the seasonally flooded forest or *paa boong paa thaam* (Khon Kaen University, 1996)[3]. However, DEDP did not ingratiate itself with civil society organizations that had started to become interested in the plight of local communities and the environment of the lower Nam Songkhram Basin, following a spate of expensive and damaging projects during the late 1980s and early 90s, the most notorious of which was the Pak Mun Project in Ubon Ratchatani Province (e.g. Foran and Manorom, 2009). Breukers (1998:28) went further in stating DEDP "...has made little effort to accept advice, critique or alternative ideas from local people, non-governmental organizations (NGOs), the NEB or academics."

Theatres of Power

During the mid-1990s the Thai NGO, the Project for Ecological Recovery (PER) had begun working with local communities, building a network of concerned stakeholders and collecting data about wetlands-based livelihoods in the planned inundation area of the Nam Songkhram Project. Some of their findings were published in Thai language media and English language publications such as Watershed, produced by PER's sister organization, the Bangkok-based Towards Ecological Recovery and Regional Alliances (TERRA), often using interviews from local resource users (e.g. Watershed 1996 and 1999). These articles tended to stress the underlying dichotomies and inconsistencies between the positivist, universal and scientific claims to legitimacy presented by the state agencies responsible plus their hired consultants and the more contextual, situated and local knowledge garnered from resource users in communities locally. Thus, reading the views for example of Mr Sinsamout Pakprom, a 66 year old fisherman and past headman of Ban Pak Yam at the confluence of the Nam Songkhram and Nam Yam (Watershed, 1999), it becomes apparent that the principle problems facing local villagers is not one of water scarcity for agriculture or flooding, but issues of resource degradation, flooded forest clearance, overfishing, agricultural intensification, land disputes with agribusiness and lastly, concerns related to the construction of the Nam Songkhram Project dam itself.

In late 1997, PER organized a public seminar about the Nam Songkhram Project, inviting a mix of stakeholders including local people, representatives of the EIA team,

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[3] This detailed report by Khon Kaen University lecturers on *paa boong paa thaam* was possibly the first study of its kind in Thailand to specifically consider this poorly recognized and threatened wetland habitat for an EIA. While it contained some methodological flaws and was bound by rather narrow Terms of Reference no doubt, it did manage to highlight the close dependence of local communities on this habitat and its significant livelihood value.

NEB staff, academics, local and national NGOs, the technical consultant and head of planning from DEDP (Breukers, 1998). The seminar took place at Chulalongkhorn University in Bangkok, a venue that would seem infinitely more familiar and comfortable to the academics and engineers of the state and consultancy institutions than it would to villagers from Nakhon Phanom or Sakon Nakhon. Lohmann (1998) described the proceedings in terms of a play or carefully scripted "charade", where the participants (actors) were supposed to act along to a neatly scripted plot in which the "experts" (DEDP officials and academic consultants) imparted knowledge about the project to placid listeners who were expected to ask a few technical questions and negotiate terms for compensation or minor mitigation, but not question the underlying rationale for the project itself. As the day wore on and the questions became more probing exposing numerous inconsistencies and factual errors, the charade turned to farce as the project developers could no longer keep up the pretence that the project was beneficial to local people, as DEDP had always claimed. A local teacher called Ekachai Khasawong from the Nam Songkhram Basin summed up the feelings of many participants by suggesting that the Nam Songkhram Project had "momentum but no rationale", according to Lohmann (1998). Lohmann concluded with the opinion that, "Vested interests, including political parties, quarrying interests and bureaucracies were the main parties pressing for construction."

Despite this "theatrical" meeting and gathering local and national opposition, DEDP pressed on with plans to dam the Nam Songkhram, even purchasing land at the headworks for a price reported as US$1.2 million (Breukers, 1998). The Khon Kaen University team completed their EIA and Environmental Mitigation Plan for DEDP which was duly passed on to the NEB for approval. However, following the Asian economic crash of 1997 and increasing fiscal saving by the government compared to the heady economic boom days of the early 1990s, it was becoming both harder to internally justify large-scale infrastructure projects and the political winds of fortune were starting to wane for DEDP and certain other Nam Songkhram Project proponents. Political indecision over the merits of dam building and increased civil society opposition led to long delays and calls for extra studies, inevitably resulting in rising costs. Local alliances between villagers, academics and NGOs were becoming stronger and a local group called the "Nam Songkhram Basin Conservation and Rehabilitation Club" was formed with one of its objectives to cancel the Nam Songkhram Project (Breukers, 1998; Blake and Pitakthepsombut, 2006b). This network joined the increasingly vocal Assembly of the Poor in 1997, a nationwide people's movement which campaigned for social and environmental justice and recompense for those affected by state-led projects (Breukers, 1998; Missingham, 2003).

Following the change of government in January 2001, the new Thai Rak Thai majority government started implementing a series of sweeping bureaucratic reforms which led to the disbandment of the DEDP and the former MoSTE, which was replaced with the Ministry of National Resources and Environment (MoNRE). Under Thaksin Shinawatra's "CEO style" leadership, the leading party set about replacing the old bureaucratic polity with new "more efficient business[like] methods" of governance (Baker and Phongpaichit, 2005). Ministries control over policy making was diminished through extensive bureaucratic reorganization and new advisory bodies were set up. More responsibility and budget was ceded to both the new Sub-District or Tambon Administration Organizations (TAO) and handpicked provincial governors to manage local development projects than ever before, in an apparent move towards decentralization. Certain state agencies started showing interest in the Lower Nam Songkhram Basin as somewhere other than a site of agricultural intensification and large-scale irrigation development. For example, the Department of Environmental Quality Promotion (DEQP) under MoNRE began to work with local communities which had earlier opposed the Nam Songkhram Project and assist Ban Dong San with seasonally flooded forest conservation of the contentious Tung Pan Kan floodplain area (see Guayjaroen, 2001), which would have been permanently flooded under the storage reservoir for the Project. Similarly, the Office of Natural Resources and Environmental Policy and Planning (ONEP) proposed the Lower Nam Songkhram River Basin (LSRB) as a suitable site for the Thai Demonstration Site of the four nation Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme (MWBP) which evolved out of a long consultation and planning process between 1996 – 2004 prior to actual implementation.

You can't keep a good dam down

Following years of indecision, local opposition and the dissolution of DEDP, the Nam Songkhram Project was eventually rejected by the Thai Cabinet in March 2002, in a resolution that agreed with the earlier findings of the NEB which found that the project carried unacceptably high environmental impacts and was not justified on economic grounds (Blake and Pitakthepsombut, 2006a). However, the Nam Songkhram Project did not disappear entirely but merely was put to rest for a few years under the care of the Royal Irrigation Department (RID), which had inherited the plans of the Khong-Chi-Mun Project and its sibling projects from DEDP. In August 2005 at the height of the rainy season, the Nam Songkhram Project made an unexpected return to the negotiating table during a flying visit by Prime Minister Thaksin Shinawatra and other senior politicians to see the flooding across the LSRB, which was described by politicians and press as a "natural disaster". He proposed at a public meeting in Sri Songkhram District that the construction of a water regulating dam at the mouth of the Nam Songkhram and a further one on the nearby Nam Oon tributary would help ease flooding and encouraged concerned agencies to set to work immediately (Blake and Pitakthepsombut, 2006b). This plan tallied perfectly with the vast sums of money being set aside for implementing the Thaksin government's water infrastructure projects to tackle water problems in Northeast Thailand, including the trans-national and pan-regional "Water Grid" project (e.g. Samabuddhi, 2005; Floch et al, 2007). Molle (2007:12) quoting a September 2003 news article in The Nation reported that the Thaksin administration announced it would "help turn Thailand into an agricultural powerhouse" by spending US$ 5 billion on bringing irrigation to nearly all un-irrigated areas of the country, especially the Northeast.

While the Nam Songkhram Project does not appear to have moved forward much since 2005, the smaller Nam Oon Project to build liftable watergates and construct a 50 MCM storage reservoir upstream flooding a large area of seasonally flooded forest, paddy fields used by villagers for dry season cultivation and abandoned plantations belonging to Sun Tech Group. This project, also managed by the RID has seen considerable activity from state officials in local communities to build up a support base, and surveying lands both upstream and downstream, presumably as part of a feasibility study. The project is estimated by RID to cost 300 million baht and would irrigate 28,000 rai (4,480 ha) in the dry season and 60,000 rai (9,600 ha) in the wet season by pumped irrigation. However, it is unclear if this includes the full cost of the irrigation system and all associated compensation costs for lost land. Locally opinion seems to be mixed on the merits of this project, with much doubt and uncertainty apparent amongst villagers about who would benefit and who would lose. The author attended a so-called "public hearing" for the project organized by RID and attended by local headmen and state officials in Sri Songkhram District on 29 March, 2006, but it was apparent that very little public information was available about the project despite an apparently advanced status of planning.

Since then the political fortunes of Thaksin's Thai Rak Thai party have irrevocably changed after a tumultuous few years and many of the politicians associated with the Water Grid project have been barred from politics for five years, including local powerful figures that had shown support for both the Nam Songkhram and Nam Oon projects. However, following the December 2008 appointment of the Democrat Party's Abhisit Vejajiva as Prime Minister, one of the principle architects of the Water Grid Project and leader of the Peua Paen Din (For the Motherland) Party, Suwit Khunkitti was appointed Minister for Natural Resources and Environment (The Nation, 21 December 2008). This position gives him control over the DWR and a strong likelihood that the Water Grid and its sibling water infrastructure projects will be revived and pushed forward. Thus it would not be surprising to see a return of the Nam Songkhram Project or a similar incarnation integrally linked to the Water Grid project and its vision of piping water from Laos or the Mekong mainstream into the "parched" heartlands of Isaan.

Case 2: Sun Tech Group Company Ltd and allied companies (agribusiness)

Agribusiness promotion and development has long been a core component of central government's vision for Northeast Thailand, even as agriculture's share of GDP has gradually dwindled (Bello et al, 1998; ADB, 2001). It fitted neatly into the state's plans, expressed in successive National Economic and Social Development Plans

Box 4. Agribusiness Promotion in Nam Songkhram Basin

The origins of the Thai tomato processing industry can be traced back to efforts by the "Royal Projects" initiative to alleviate poverty and provide employment in poor areas of the North and Northeast, as well as state efforts to counter the growing threat of communist insurgency in the same isolated parts during the 1970s and 80s. A Royal Projects processing factory was established in Sakhon Nakhon Province in 1980. From the late 1980s onwards, further factors encouraged the growth of the industry including a growing domestic demand for tomato paste, recognition of the potential to tap export markets, generous financial incentives available from the Board of Investment (BOI) to promote the industry, especially in Northeast Thailand, and lastly new opportunities opening up to engage local smallholders in contract farming arrangements due to wider socio-economic changes occurring. As a result the industry expanded rapidly and as result by 1995-96 there were 16 tomato processing factories in Thailand, eight of which were in the Northeast, accounting for 70 % of total Thai production. At least two of these factories were located in the lower Nam Songkhram Basin, including the Sun Tech Group Public Company Ltd factory in Sri Songkhram District, Nakhon Phanom Province. The other company was called the Northeast Agricultural Investment Company (NAICO) which was part owned by the New Zealand holding company Brierley Investments Limited (BIL) in the mid-1990s, until it collapsed in the wake of the 1997 Asian economic crisis (Source: Pritchard and Burch, 2003).

since the mid-1970s to commodify and intensify agriculture as a means to bring rural inhabitants out of poverty and boost export earnings from agricultural products. An integral part of this vision was expanding irrigation infrastructure, promoting use of agrichemicals and biotechnology and moving farmers away from subsistence agriculture to market-oriented production methods. While the 4th NESDP (1977-1981) saw agro-industries grow rapidly, especially canned fish, pineapple and tomato products, the 6th NESDP (1987-1991) promoted the integration of farming and processing to capture higher value-added exports, which included encouraging firms to use the contact farming model of production (Sriboonchitta and Wiboonponse, 2008). Sriboonchitta and Wiboonpongse (2008) (citing Glover, 1992), stated that "Compared to other Asian countries by early 1990 Thailand probably had the most extensive experience with contract farming and the widest range of crops". They mention a "Four Sector Co-operation Plan to develop agriculture and agro-industry", which in theory expected agro-industry, farmers, financial institutions (particularly the state-owned Bank for Agriculture and Agricultural Cooperatives (BAAC)) and government agencies to work together for improvement of production systems to reduce price risk and market uncertainty, with farmers required to improve their technical knowledge and increase production efficiency.

Box 5. Sun Tech Group Public Company Limited

Described as "the largest Thai producer of canned tomatoes in the mid-1990s", Sun Tech Group was established as a fruit and vegetable processing company (Pritchard and Burch, 2003:220). Apparently, it was one of 12 subsidiaries of the massive NTS Group, a Thai-owned conglomerate which is said to have interests in food, scrap metal, steel production, video rental, entertainment, real estate and retailing. Sun Tech Group after quick initial growth was hit by a slump in export sales of tinned tomatoes in 1992-93, which almost brought it to the brink of collapse. However, by diversifying into new areas it survived, but the tomato processing side of the business in Nakhon Phanom suffered and experienced annual losses until the economic crisis hit in mid-1997. The parent company NTS Steel Group is owned by the Horungruang family, the senior member of which following the Asian economic crisis became "….the second largest individual debtor in Thailand, with debts totaling more than $2.1 billion (US)" (Pritchard and Burch, 2003:221). By May 1999 the company's shares ceased trading on the Stock Exchange of Thailand (SET) and in April 2001 was forced to submit a restructuring plan to creditors to avoid de-listing. According to Pritchard and Burch (2003:221) "Although technically bankrupt, at the time of writing the Sun Tech Group continues to operate, and still produces canned tomatoes for sale to western supermarkets." During 2004 to late 2006, the company continued processing a limited amount of tomatoes from its factory sourced from its own plantations and under contract from local farmers, but in early 2007 it ceased production and the factory was closed, laying off the last remaining staff (personal observations). However, according to a web report, Sun Tech Group Public Company Ltd changed its name to Apex Development Public Company Limited in April 2007 following a court ruling and is now listed on the SET and trading normally again, primarily involved in real estate development in the Eastern Seaboard. It remains to be seen what will happen to the factory and land assets in Sri Songkhram District.

(Sources: Pritchard and Burch, 2003; http://www.apexpcl.com/ir/index.html; personal observations)

Against this policy background, agribusiness started locating in the LSRB from 1978 onwards, with the formation of the Tawan Farm company, which engaged in contract farming and using its own plantations to grow sunflowers and other intensive export crops (Guayjaroen, 2001). The next company to establish itself in the LSRB was called Ut-sahagam Kaset Isaan (Isaan Agro-industry Company) on the Nam Songkhram floodplain of Segaa District, Nong Khai Province. This company moved into intensive dairy farming, sweetcorn and tomato processing, using both its own plantations and contract farming for raw material supply. Then followed the Sun Tech Group Company Ltd in 1988, by owners who had previously been involved in the scrap metal processing trade in Chonburi Province (see Box 4 and Box 5).

Backed up by state development policy, cheap credit and generous financial subsidies, for instance allowing the tax-free import of Taiwanese machinery for tomato processing factory in Sri Songkhram, Sun Tech Groups factory boomed for a while in the early 1990s (Blake and Pitakthepsombut, 2006b). It employed hundreds of local villagers, both working in the factory and on the company plantations, as well as buying tomatoes from farmers in surrounding districts under contract. From initially concentrating on tinned tomatoes, pineapple and sweetcorn, Sun Tech also decided to diversify into eucalyptus plantations on land acquired further upstream in Agad Amnuay District of Sakhon Nakhon Province, and set up a sister company called Asia Tech to expand the plantation business from the Nam Songkhram Basin into Indochina (Watershed, 1996). Asia Tech Group Ltd. had plans of carpeting the floodplain of the Nam Songkhram and neighbouring parts of Lao PDR with *Eucalyptus camaludensis* and *Acacia mangium* plantations and then bringing the wood back to Thailand for processing in a pulp and paper mill it would build. This vision was thwarted by the collapse of the baht following the Asian economic crash, leaving Sun Tech and Asia Tech with massive dollar denominated debts. Much of the collateral for its rapid expansion programme into Indochina, including plans for industrial estates in Viet Nam, was based on the its extensive land holdings in the LSRB, valued at 20,000 baht/rai according to one local source (personal communication, Laothai Nilnuan, May 2008). By my estimates, Sun Tech Group and its associated companies held at least 12,000 rai (1,920 ha) of land at its peak, which at 20,000 baht/rai would be worth 240 million baht. Thus, it was apparent that the growth of agribusiness in the LSRB was about far more than just agricultural production alone.

The floodplain land used by Sun Tech for had been obtained by an ingenious mix of methods, both legal and illegal but all rather devious. For example, the 7,000 rai of land Sun Tech acquired on Tung Mon floodplain in Sri Songkhram District was previously classified by the state as "*tee rok wang plao*" (wasteland) and "*tee satarana prayote*" (public land) (Blake and Pitakthepsombut, 2006b). Located within a large meander of the Nam Songkhram, it was covered with part seasonally flooded forest (*paa boong paa thaam*) and part open scrubby grasslands and drained by several streams. Each rainy season, the entire area was inundated for two to three months and would become an important fishery, including being a known feeding ground for the IUCN Red-listed fish species, the Giant Mekong Catfish (*pla beug*). While villagers living in the four surrounding villages extensively utilized the land for livestock grazing, subsistence cultivation of rice and vegetables, fishing and harvesting of a wide variety of wetlands products (i.e. common pool resources) (Blake, 2008). Nobody held formal land ownership documents, but a complex informal *de facto* ownership rights system and communal management of CPR resources existed.

Using a complex web of agents, compliant local officials and aspects of state bureaucracy to win over the cooperation of village headmen from the surrounding communities, Sun Tech company was able to buy up all the land at Tung Mon over the course of a year or two, and then convert their claim into *de jure* land title documentation. The sums paid for the land was anywhere between as little as 150 baht/rai (Blake and Pitakthepsombut, 2006b) up to a maximum of 1,000 baht/rai (i.e. US$ 37.5 – 250 / ha[4]). Some villagers reportedly did not actually know how much land they used on Tung Mon and could not understand the documents they were asked to sign or thumbprint, but went along with the process on the advice of the headman and believing that if they didn't surrender their rights, they may not get anything in return (personal communication with villagers in Ban Tha Bor and Ban Don Daeng on several occasions). In Ban Tha Kong, a small village on the banks of the Nam Songkhram which had missed out on state-provided electrification due to its size, managed to request the company to provide mains electricity in return for giving up their community rights to Tung Mon (Blake, 2008). Sun Tech similarly acquired another large plot of several thousand rai on the Nam Oon floodplain to the west of Sri Songkhram township. Altogether, one report suggests that agribusiness companies may own up to 60,000 rai (9,600 ha) of land in the LSRB (Watershed, 1999).

Once the company had ensured ownership of the land, it set about bulldozing flat and burning the native vegetation, leveling the surface, then splitting the land into 400 rai (64 ha) blocks with access roads between them. The land was encircled by fencing to complete the commons enclosure. Cultivation methods for such a large scale plantation were equally big, expensive and intensive. Aerial spraying of pesticides was used, until the light aircraft crashed one day near Ban Khae (personal communication with ex-Sun Tech employee; 3 April, 2007). After that the company reverted to tractor-mounted spraying on a regular basis. Soil had to be prepared using dolomite, as it naturally was acidic. Liberal quantities of agrichemicals had to be applied to the crops to ensure standardization, minimise pest damage and high productivity. Tomato seedlings were planted in January, after the soil had dried out sufficiently and harvesting took place in late February and March. Irrigation was achieved by pumping water from the river via a system of pipes and using ridge and furrow flood irrigation. To assist drainage and avoid waterlogging, a network of sub-soil pipes was laid. It was only possible to grow one crop a year due to the flood prone nature of the site, which was a distinct agro-ecological limitation to production known prior to acquisition[5].

Inevitably conflicts arose between the plantation managers and local villagers from time to time. First there was some resentment that people had been unfairly evicted from former communal land and those that had claimed ownership were given paltry compensation for their land. Secondly, there was the issue of loss and restriction of access to former common grazing land and loss of CPR, formerly benefitting just about all households. There are some 600 households in the four villages surrounding Tung Mon (Blake, 2008) and formerly people from villages further afield would also come to utilize the rich wetland resources found there at certain times of year. When people tried to take their buffalo or cattle onto the land to graze before or after the tomato cultivation season, they were often met with threats and abuse by company staff. Due to the loss of available grazing, some villagers had to sell off or reduce their herd size, thus hurting their long-term livelihood prospects. Thirdly, villagers still tried to utilize wetland resources and fish both within the company perimeter and around the edge, but reported that due to the use of pesticides there were occasional pollution events, with fish kills occurring in Huay Sing stream and other small watercourses, which are considered common property by villagers. Thus,

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[4] Up until devaluation in July 1997, $US 1 was roughly equivalent to 25 Thai baht.

[5] The NEDECO/TEAM (1983) feasibility study had proposed poldering large parts of the floodplain with Dutch-style dykes to exclude seasonal floodwaters and allow rainy season production.

there was an environmental and human health hazard aspect to Sun Tech's practices that was never examined by the authorities, as far as the author can ascertain. This may still be of concern today, when one observes that the abandoned plantations have not revegetated as might be expected, but retain a look of contaminated land and soil.

Box 6: Choosing the right tree crop for the "problematic" floods

"The Songkhram River has a problem with flooding in the rainy season. Other crops or trees cannot be grown on the lands.......My objective was to experiment with eucalyptus, because I had an idea that eucalyptus could grow in areas where other crops could not grow. My idea was to change the flooded areas to forest by planting eucalyptus." (Source: Interview with Paiboon Nititawan, President of Asia Tech Group. Watershed, 1996).

As previously mentioned, Sun Tech and its sister company Asia Tech, were also involved in the planting and promotion of fast growing pulp trees on part of 3,000 rai (480 ha) of public land it had acquired in Agad Amnuay District upstream from Sri Songkhram, using equally suspect methods (Blake and Pitakthepsombut, 2006b). But unlike Tung Mon which was shared by several villages, Tung Pan Kan was principally the common property resource of a single village, Ban Dong San. After the company started bulldozing the seasonally flooded forest and planting eucalyptus and *A. mangium* seedlings and excluding villagers from their traditional fishing, hunting, foraging and subsistence dry season rice growing territory, the villagers started to exercise resistance and assert their legal rights. Helped by the Thai NGO Project for Ecological Recovery (PER), local academics and lawyers, community leaders in Ban Dong San at first petitioned local government offices, but when it was suspected that state officials had been complicit in altering the status of the public land to private land status, the villagers were obliged to seek redress through the court system (Guayjaroen, 2001). Even though it took six years and a lot of effort, the villagers were eventually victorious in their battle and the Sakon Nakhon Provincial court ordered the company return the land on Tung Pan Kan to the village as public use land in 1996. Of relevance perhaps in the court's decision was the fact The company felled much of the eucalyptus plantations over the next two years, but many trees on the flood prone land had simply failed to grow and were engulfed by *paa boong paa thaam*, which shows remarkable resilience to disturbance and can recover quickly under certain conditions. In 2004-05, the villagers of Ban Dong San decided to convert about 2,400 rai of Tung Pan Kan to irrigated dry season rice cultivation and divide up the land into 20 rai blocks for each family (Blake and Pitakthepsombut, 2006b). The remaining 2,000 rai of land was to be retained as community forest, and this conservation project was subsequently the subject of assistance by the Dept of Environmental Quality Promotion.

Despite the total failure of Sun Tech and Asia Tech's agribusiness ventures on the Nam Songkhram floodplain, and reports of vast unserviced debts, the company and its successor Apex Development PCL have somehow managed to avoid bankruptcy and liquidation of assets. This suggests that it has some powerful connections that have helped to avoid its demise and allowed it to carry on trading, albeit under another name. The question remains, therefore, what will the company do with its extensive land holdings in the LSRB, which are now sitting idle to all intents and purposes? In mid-2007, there was evidence that some ex-agribusiness farmed land was being sold off near Ban Tha Rae village in Agad Amnuay District, Sakhon Nakhon by the Bangkok Commercial Asset Management Co Ltd[6] suggesting it had been seized by the state. However, it was unclear if this was land formerly belonging to Sun Tech Group or not. Given that the company still has land it purchased cheaply on the floodplain at several locations, all of which have been repeatedly slated as potential sites for inundation by state-owned irrigation reservoirs, then it would not be beyond the realms of possibility that it could be holding out in the hope of a large irrigation projects to proceed and therefore recoup some of its losses from compensation payments. In conclusion, it could be said that while Sun Tech is down and has failed in its heavily subsidized bid to turn the Nam Songkhram floodplains into a major site of export-led intensive agriculture, it is definitely not out of the picture. It would seem that there is still much at stake for failed agribusiness giants, in terms of cashing in valuable land assets and turning loss into profit.

Case 3: Upper Songkhram Project (irrigation & flood control)

This case study is briefer than the other two for the simple reason that there is less information in the public domain concerning the history, implementation and outcomes of this Project. What is known is mostly based on the author's personal observations made during several visits to the area between 2005 – 2007, conversations with a few stakeholders and some limited information contained in a single 1997 Thai language report dating from the time that the project was under the control of the now-defunct Accelerated Rural Development Office (ARD). The details of the two main dam projects planned under this project are given in Table 2 below.

These two projects were the largest water infrastructure components of a larger rural development project implemented by the ARD in the so-called Upper Songkhram Basin, encompassing parts of Udon Thani and Sakhon Nakhon provinces, of which the Nam Songkhram River forms the provincial boundary. The core idea of this "Upper Nam Songkhram Project" was to boost local incomes and raising agricultural productivity through construction of irrigation schemes across the region. Some would be traditional water storage and gravity-fed irrigation, while others would be pumped irrigation, along the lines of the systems promoted by DEDP. The Ban Muang and Ban Nong Gaa "weirs" as they were euphemistically termed, were to be the lowest water control structures in the overall plan, allowing for a combined irrigated area of 48,000 rai (7,680 ha) in the wet season and 9,600 rai (1,536 ha) in the dry season. They were called "weirs", but in actual fact were concrete dam structures with liftable watergates similar to the design for the Nam Songkhram and Nam Oon Projects in Case 1, and would theoretically have a combined water storage capacity and surface area of 15 MCM and 6.6 km^2 respectively. This would inevitable require the flooding of land on the floodplain to create the reservoirs, causing inevitable loss and damage to valuable wetland habitats extensively used by local communities for livelihoods. The cost in US dollars at a pre-crash 1997 exchange rate of 25 baht /

[6] It is unclear if this finance company is part or wholly state owned at present, or how they came to be the owners/executors responsible for this large land plot, extending to almost 5,000 rai (800 ha). The company's website may be found at http://www.bam.co.th/bam/corporate/index.php?. According to a short article in the Bangkok Post dated February 2, 2007, Bangkok Commercial Asset Management (BAM) is state owned and was "first set up by the central bank's Financial Institutions Institutional Development Fund to oversee the liquidation of the defunct Bangkok Bank of Commerce". It anticipated that it may in future be listed on the Stock Exchange of Thailand (Source: http://www.encyclopedia.com/doc/1G1-158749696.html)

US$ would have been US$ 9.8 for Ban Muang system and US$ 23.76 for Ban Nong Gaa system.

Table 2. Details of two irrigation schemes planned for the middle Nam Songkhram River.

PROJECT NAME	**Ban Muang Weir**	**Ban Nong Gaa Weir**
PROJECT LOCATION	Ban Muang Moo 1, Ban Muang Sub-district, Ban Dung District, Udon Thani	Ban Nong Gaa, Ban Jan Sub-district, Ban Dung District, Udon Thani
Catchment area (km^2)	1,654	2,286
Average Annual run-off (MCM)	800.49	1,093.70
Water storage capacity (MCM)	4.00	11.00
Area of storage reservoir (km^2)	1.8	4.80
No. of gates	5	6
Height of dam (metres)	3	3
Irrigation potential – rainy season (rai) - dry season	15,000 3,000	33,000 6,600
Estimated 1997 cost of construction (Million Baht)	245	594
Area of land actually irrigated (2007 observations by author)	0	0

(Source: adapted from Accelerated Rural Development, 1997, cited in Blake and Pitakthepsombut, 2006a)

For one reason or another, ARD was slow to implement these projects in the late 1990s and during the 2002 bureaucratic reorganization by the Thaksin regime, ARD went the same way as DEDP and was dissolved. Its portfolio of water management projects was passed on to the newly formed Department of Water Resources (DWR) who wasted no time in implementing these two dam projects. DWR first built Ban Muang "weir" in 2003 and later completed Ban Nong Gaa "weir" in late 2004.

The author visited both project sites in January 2005 and returned on several subsequent occasions over the next two years (including during the Environmental Flows Intermediate Assessment fieldwork), culminating in a canoe trip along the entire river reach above and below the dams in July 2007 (Blake, 2007). It was apparent that both dams were causing considerable negative environmental impacts; including total blockage of water flows in the dry season; obstructing the upstream and downstream migration of fish and other aquatic organisms; loss of extensive riparian vegetation and wetland habitats; aggravated flooding locally; induced soil salinisation; altered channel morphology causing increased bank erosion and sedimentation (Blake and Pitakthepsombut, 2006a). No EIA had been conducted prior to the dams being built and there appeared to be no feasibility study prepared by DWR (Blake et al, 2009). The most noteworthy observation was that there was not a single household or rai of land benefitting from irrigation as a result of the two dams, in either the wet or dry seasons during site visits in 2005-07. Local people interviewed seemed to have very little idea about the supposed purpose or beneficiaries of the project and no staff were stationed at the dams to monitor or maintain them. Both structures were already showing signs of wear and poor construction technique within two years of completion. So if the dams were not built for irrigation purposes, what were they built for and had the main objectives of the dams change?

I posed these questions to a senior official from the DWR's Area 3 office in Udon Thani that is responsible for the dams, during a Nam Songkhram E-Flows meeting in May 2006 that brought together a number of stakeholders from various agencies. He claimed that the two dams were built for flood control, but when I pointed out that they were patently not achieving this goal but may well be exacerbating flooding locally, he changed his mind and claimed that they were in fact for local domestic consumption. When I also pointed out that the dams were not being used for this purpose either, he eventually claimed (I suspect tongue-in-cheek) that they were "*for local people to bathe in*". This wonderful piece of farce was reminiscent of Lohmann's (1997) description of the unfolding "drama of development" at a seminar for the Nam Songkhram Project (see Case 1). It seems that for some powerful actors, who might be termed as "hydro-hegemons"[7] (see Zeitoun and Warner, 2005), water resources infrastructure development is always justified, no matter what the cost.

At the local level, it was apparent that the nearby communities were not only suffering the multiple impacts created by the two dams, but they also had now been saddled with the "ownership" of them. Signs erected by DWR near the rusting and defunct dam structures announced that "*The Department of Water Resources Area 3 Office hands over this weir to the people of Ban Jan Sub-district for the public benefit and to help maintain*". Hence, presumably this also implied that they were also responsible for the costs of maintenance and the DWR would not be responsible for the impacts or risks arising from their construction.

Apart from obvious signs of soil salinisation occurring around the Ban Muang structure, there was also rapid soil erosion occurring around and behind the concrete dam during rainy season flow conditions causing loss of agricultural land and weakening the entire dam structure, creating a potential hazard. In the rainy season during flood conditions, both structures became totally inundated and inoperable.

IV Arenas

<u>Research question</u>

Q/ What were the arenas used in the decision-making processes? How was this defined, legitimized, accessed or created?

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[7] Hydro-hegemony, notes Zeitoun and Warner (2005), is achieved through water resource control strategies such as resource capture, integration and containment at the river basin level by more powerful actors within a weak institutional context, using an array of tactics including knowledge construction. DEDP, DWR and RID would fit the description of hydro-hegemons well.

The arenas used in the water resources decision-making processes have changed and evolved over time, partly in response to larger transformations in governance and policy making at the national level, but also reflecting growing local awareness and mechanisms for involvement at the sub-basin level. In the case of the **Nam Songkhram Project**, a slow but gradual process towards more inclusive, informed and transparent water governance can be detected. From its first definite incarnation as a large, multi-dammed, complex engineering, water infrastructure project envisaged in the NEDECO/TEAM (1983) report, the Nam Songkhram Project evolved over the next two decades of socio-political change in Thailand to include progressively more actors and stakeholders in the negotiation process. It started as a highly techno-centric process, that involved Dutch and Thai consultants making plans for submission to the Thai and Netherlands governments through the auspices of the Mekong Committee. Local consultation was not evident in the report and it was very much assumed beneficiaries of development assistance were passive participants in the process. To the consultants, the problems of water governance were clear – scarcity or drought in the dry season and floods in the wet season. The local people were rice farmers first and foremost, who it was assumed would want irrigation in the dry season and flood control in the wet season, to boost their agricultural production as recognized by Breukers (1998). While this superficial analysis of the problems and solutions has essentially remained static in the main water provisioning bureaucracies of the country, the wider societal understanding of water needs in relation to socio-economic, cultural and environmental considerations has changed considerably.

Hence, civil society groups at the international, national and local / grassroots levels have been able to open up space and challenge some of the dominant myths surrounding not only water governance in the Nam Songkhram Basin, but also questioning facets of the rationale of development itself. Thus, Lohmann (1998) in his political ecology-type analysis of the NGO-organized seminar in December 1997 to consider the provisional conclusions of the state's EIA studies, likened it to a "multiple theatre of power in which development unfolds". The participants were "actors" in every sense of the word argued Lohmann and were expected to play strictly defined roles, which in the event exposed some rather shakey underpinnings to the project's chief justifications and assumptions. This seminar involving multiple stakeholders might be classed a Multiple Stakeholder Platform (MSP) broaching Tracks 3 and 4, according to Dore's (2007:213) examples, was itself attributable to the space opened up by the Thai civil society movement during the years following Black May of 1992 (see Baker and Phongpaichit, 2005). The timing of this seminar is significant in that it came soon after the so-called "People's Constitution" of 1997 had been ratified by the Chavalit Yongchaiyuth government, which for the first time placed far higher emphasis that previous constitutions on such notions as human rights, gender equality, and rights to form groups, associations, unions, cooperatives and private organizations. Furthermore, it allowed for the decentralization of powers and decision-making to local bodies and greater participation in the management of natural resources for local communities (e.g. Article 46, 56 and 79) (Blake and Pitakthepsombut, 2006b). Thus, while the Nam Songkhram Project seminar did not persuade the developers to drop their project or even alter it radically, it is argued that this MSP-like 1997 event did apply subtle pressure on state agencies to be more transparent with information and it certainly empowered civil society actors and observers that their approach of challenging positivist, scientific-based knowledge with more relativist, locally-situated and holistic knowledge was justified through exposing multiple flaws in the former.

Since that time, the political will and economic justification for the Nam Songkhram Project faded, while the opposing environmental and socio-cultural case against strengthened in the late 1990s and early part of the millennium. At the same time, sweeping bureaucratic reform in 2002 creating new environmentally-focused departments such as ONEP and DEQP in the Ministry of Natural Resources and Environment and changes to several other key ministries, plus dissolution of the DEDP ensured that the Nam Songkhram Project was of low priority by the time the Cabinet cancelled it in 2003. Around the same time, new initiatives were starting in the Nam Songkhram Basin, such as the MWBP[8] project in the LSRB based in Sri Songkhram District. This project was seen by some actors as a timely and viable alternative approach to the narrow-focused Nam Songkhram Project and worked as an effective bridge between the various stakeholders. Thus, state and non-state actors participated in a wide variety of activities and platforms initiated by MWBP, a few of which are discussed in more detail in the Process and Tool Reviews. MWBP redefined the problems and solutions to the local situation, through wide participation, consultation, use of innovative tools and most importantly, following an ecosystem-based approach to development.

However, as noted earlier, the Nam Songkhram Project did not disappear entirely and made a re-appearance in 2006, following political pressure applied by both local powerful interests and expressed publically by the populist Prime Minister, in line with his party's mega-project visions for Northeast Thailand. Even after his ouster, the Project was still being gently pushed by various interests in the bureaucracy (in particular RID) and private business spheres, who would benefit financially from its implementation. In the short term, it seems that the same vested interests have in the meantime backed the smaller and cheaper option of the Nam Oon Watergates Project for more rapid implementation, seeing potentially less local opposition and legal obstacles standing in the way of the project, such as carrying out an EIA or SIA or full cost-benefit analysis. At the same time, local consultation and participation in project planning has been far from ideal, raising serious doubts about the outcome of this 300 million baht (US$ 8.6 million) project, should it proceed.

For the second **Sun Tech Group agribusiness** case, it would seem that the arenas used for the decision-making process were largely top-down and non-participatory throughout the tenure of the company's regime. Using government policy specifically endorsing the expansion of agribusiness in Northeast Thailand to take advantage of generous subsidies and financial incentives, the company was able to establish itself in the LSRB, which it believed offered fertile soils and a benign climate for export-oriented cash crops. The state and financial institutions provided cheap credit and tax breaks to also set up a processing factory, which incidentally also included the construction of an adjacent dam and water storage reservoir, flooding lands formerly used by the communities of Ban Don Daeng and Ban Kaa. No compensation was given to impacted local people for their lost livelihood opportunities. Through exploitation of weak land laws and taking advantage of both a powerful network of state officials to help facilitate common land acquisition and local ignorance of

[8] The MWBP was a five-year (2004 - 2009), US$30 million initiative, of which only Phase A (2004-2006) was completed. The Programme was jointly managed by IUCN (the World Conservation Union), the Mekong River Commission (MRC) and the United Nations Development Programme (UNDP), in partnership with government and nongovernmental actors in the four countries in which it operated: Thailand, Cambodia, Lao PDR, and Vietnam; http://www.mekongwetlands.org

constitutional rights, Sun Tech were able to buy up large areas of floodplain wetlands at cheap prices, formerly rich in common pool resources. Once the land had been converted to official land title documents, they were then able to finance expansion to new resource frontiers in Lao PDR and Viet Nam, by lodging the land title as collateral for bank loans. The land was valued far above its purchase price, thus allowing the company great financial leverage for new speculative business.

However, Sun Tech Group executives were not adequately prepared for big fluctuations in the global demand for their core product of processed tinned tomatoes or the relatively high costs of production on the problematic, floodprone soils of the LSRB. Pritchard and Burch (2003) charted Sun Tech's waxing and waning fortunes, along with other agribusiness actors involved in the processed tomato industry in Northeast Thailand, documenting how even after the Asian Economic Crash of 1997 and the technical bankruptcy of Sun Tech, they still managed to somehow keep operating and trading, albeit in a much reduced manner. This phenomenon and their continued presence in the LSRB, even after eventual cessation of tomato cultivation and processing activities and a change of company name, hints at their powerful and protected nature. It would not be correct to say that Sun Tech had it all their own way, as evidenced by the case of Tung Pan Kan and the struggle between the company and villagers of Ban Dong San (Guayjaroen, 2001). Here the community took their loss of land rights and common property resources to the courts, after failing to get adequate redress to their complaints from provincial authorities and eventually won the case. Thus, the law courts could be viewed as another valid arena or decision-making forum over water and natural resource rights, although it should be noted that it is still relatively rare in Thailand for communities to take the formal legal route, as in this instance.

In Case 3, the two dams built as part of the former ARD's Upper Songkhram Project provide a little-studied example of what can happen when little or no participation of local stakeholders is carried out in project planning and implementation. As far as the author can ascertain, local communities were treated as passive recipients by both ARD and DWR throughout the planning and construction process. On completion, the dam structures were presented to the local people by the state (without specifying exactly which group were primary beneficiaries) and DWR withdrew from the area, leaving no staff to look after and maintain the infrastructure, let alone deliver irrigation or any other theoretical benefits. Hardly surprisingly, given the circumstances under which the dams were built with apparently few (or no?) feasibility studies conducted prior to construction and little (or no?) local / civil society participation during or after construction, the quality of construction was poor and the dams are already falling into disrepair. Additionally, multiple and serious environmental impacts are becoming apparent in the areas upstream and downstream of the dams, which perhaps could have been avoided or mitigated, had an EIA or Strategic Environmental Assessment (SEA) been carried out in the planning stages.

As it stands, the dams or "weirs" as these structures were optimistically termed by the developers, stand as silent monuments in the waterscape to an all-too-common failure of development in Thailand where problems are misunderstood, solutions are misapplied, decisions are made unaccountably and lessons are rarely learned. Local villagers near Ban Muang the author talked to during the 14 day canoe descent of the Nam Songkhram River mentioned earlier, asked when they were going to get an irrigation system they could use, while surveying acres of dead and dying riparian forest killed by the dam's permanently raised water table and quite possibly, the underlying salt layer's rise (Blake, 2007). This project seemed to lack any underlying

Box 7: Thailand's National Water Vision

By the year 2025, Thailand will have sufficient water of good quality for all users through an efficient management, organizational and legal system that would ensure equitable and sustainable utilization of its water resources with due consideration on the quality of life and participation of all stakeholders.

purpose and deserves further study whether they might be good candidates for dam removal and ecological restoration.

Integrated Water Resources Management and Water Planning

Up until this point, no mention has been made of the much-vaunted adoption of Integrated Water Resources Management (IWRM) principles by the Thai government and the establishment of river basin organizations or committees (RBCs) in the 25 main river basins identified nationwide[9], and what this has implied to the case of the Nam Songkhram Basin specifically. Blake and Pitakthepsombut (2006a:75)) give a broad overview of the structure of the RBC's and some of the experiences locally of implementation. One of the immediate principle problems that can be identified is that the Nam Songkhram Basin does not have a distinct and separate RBC of its own, but is split into six rather arbitrary sub-basin units which report to the supra-RBC unit termed as "Mekong Basin Area 02", that includes a plethora of smaller sub-basin units strung out along the provinces of Northeast Thailand bordering the Mekong from Loei in the northwest to Amnat Charoen in the southeast. A consortium of five private consultancy companies[10] were hired by the DWR to conduct workshops for RBC working group members in each sub-basin during 2004-05 in order to compile sub-basin water resources development plans that would inform a Master Plan for the development and management of water resources in the entire Mekong Basin Area 02[11]. This Master Plan would be submitted to the National Water Resources Committee (NWRC) and MoNRE for final vetting and approval before proposed work under the plan could commence, in theory.

In practice, it is uncertain how the process proceeded, as little recorded information about it seems to have leaked into the public sphere. From my own conversations with people from civil society who were involved in the consultation workshops, they were less than impressed by the level of participation and transparency surrounding the process. One sub-district committee member from Sri Songkhram District who had long been involved in local conservation activities commented, "It' a waste of time going to the meetings as they just want to build more big projects. They don't want to listen to my opinion or think about natural resources conservation." (quoted in Blake and Pitakthepsombut, 2006a:78). Other participants painted a similar

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[9] For a summary of the rationale for this policy, its main objectives and scope of work, refer to the document entitled "Integrated Water Resources Management in Thailand" jointly prepared by the Department of Water Resources and Department of Groundwater Resources under the MoNRE, found at: http://www.dgr.go.th/tor/image/pdf/IWRMinTHAILAND.pdf

[10] The companies contracted were: Sanyu Consultants (Thailand) Ltd, Macro Consultants Ltd, Tesco Ltd, Thai DCI Ltd, and Southeast Asia Technology (Seatec) Ltd. (Source: Department of Water Resources, 2004)

[11] According to a spreadsheet obtained showing planned expenditure for each of 25 River Basins between 2006-09, the total budget allotted to Mekong Area 02 was approximately 18 billion baht, with 8.9 billion baht of this provided to RID for infrastructure investment in "solving the water shortage problem" i.e. new irrigation systems (Department of Water Resources Department, 2005)

picture of a fixed agenda and top-down approach where state agencies brought along projects they had already designed to the table seeking approval from the RBC sub-basin committee which was heavily weighted in favour of state representatives. It was presented as being a case of merely prioritizing a pre-decided shopping list of projects, rather than any true desire to put IWRM principles into practice. Thus, hegemonic institutions like RID and DWR are able to ensure their projects are near the top of the list and projects like the Nam Songkhram Project do not disappear off the negotiating table, but remain an option dependent more on central budget approval than local need.

Molle (2007:24) in his Mekong regionwide assessment of irrigation and water policies identified the evolution of "proto-RBOs" in Thailand from their roots and concluded that even after several years of implementation they would "remain paper organizations with limited power and a consultative role rather than strong participants in arenas of negotiation and decision-making". While this may be true for some RBCs and they may seem more like rubber stamping committees for pre-determined state-led water infrastructure projects, the strong political backing given to these organizations during the Thai Rak Thai government and the strong lip service given to IWRM principles by DWR, could suggest that they will return to new prominence after the last few years of political uncertainty and inactivity for RBCs. This might depend on whether the Democrat-led government seeks to "reward"12 the Isaan people through water resources development projects or not.

Not to be outdone, the MRC in association with the Thai National Mekong Committee (TNMC) (which itself is a sub-unit of the DWR) has been working on creating a Basin Development Plan (BDP) with the objectives of making a sustainable water resources development plan in each sub-basin area identified, using input from a "wide variety of stakeholders" in a "participatory, joint decision-making process" (TNMC, 2004, cited in Blake and Pitakthepsombut, 2006a). The Nam Songkram Basin falls under area coded SA-3T which covers the eight provinces of upper Northeast Thailand and means there is considerable overlap and non-alignment with the 25 RBC plans of the DWR mentioned above. According to Thai National Mekong Committee (2004:6), 290 irrigation projects covering a total area of 267,000 ha were identified for potential development in SA-3T, which will inevitably include some of the more controversial projects. Interestingly, this TNMC report does identify the Nam Songkhram Project as having potential issues of a "trans-boundary nature" to consider before implementation should proceed (Thai National Mekong Committee, 2004:15) and considers some of the more important cross-sectoral and cross-cutting issues relevant to water management in the Mekong Basin. However, it remains to be resolved how the MRC/TNMC Basin Development Plan ties in with the RBC Master Plans prepared by DWR consultants and how closely the two processes are coordinated into a single vision or plan of action.

V Case Analysis of water allocation decision-making processes and tools

<u>Research Questions</u>

Q/ What are the important contextual factors and attributes relevant to the determination of pathways and outcomes of the decision-making?

[12] See Bangkok Post 18 December 2008, "One ring to unite them all, pledges Abhisit".

Q/ what can we learn about water allocation decision-making processes and arenas used, particularly about actors, interactions, pathways and outcomes? And how power comes into play at crucial nodes or events?

Q/ What progressive processes or tool/s have been used? If they were not used, what might have been the constraining factors or condition? Would their use likely change the arena and outcome of decisions?

Q/ Do any of the progressive processes and tools examined have potential to improve water allocation and decision-making?

Q/ What does the place case study teach us about the necessary and/or contingent conditions for a relevant process/tool to be applied and make a difference?

Q/ What is the potential of the research in the place-based case in influencing ongoing process of decision-making on water allocation issues?

Q/ What may be the potential of the case/s in informing and influencing investment and/or development pathways of the place?

"*In the current era, struggles over the KCM project, Rasi Salai and other nodes of conflict are largely about maintaining the set of relations among Thai political agents and development agencies that confer the KCM project is power effects and capacity to reach across scales. Scale and power are thus intimately related within complex environmental conflicts, and tracing their linkages through an array of actors and across a variety of scales, the approach associated with actor-network methodologies, can reveal a great deal about how power and scale are co-created.*" Sneddon (2003).

Historical roots of natural resources conflict

When considering the development trends and types of water management project that have been favoured by the state in the Nam Songkhram Basin, it is often helpful to look back at historical factors that may have predisposed one mode of development over another. Floch et al. (2007) chronicled the historical progression of water resources management in the Mun-Chi Basin since what they termed as the "Pre-Exploitation period (up to 1939)" that refers to the period prior to state sponsored irrigation schemes. They identify three main definable periods in the development of water resources in Isaan's largest river basin, namely: "The Early Years (1939-1960): Experimenting with Irrigation", the "Rise of Storage (1960-1978): Cold War Engineering"; and "Diversifying Irrigation Development (1978-2005). As there appears to be little data available concerning the Nam Songkhram Basin, I will limit my observations to historical factors of relevance to water resources management in the period after the ratification of Thailand's first National Economic and Social Development Plan (NESDP) in 1961, which roughly coincides with the period of modern developmentalism in Thailand.

To get a sense of some of the historical factors that have shaped water resources governance in the Nam Songkhram Basin, the reader is referred to Annex 2, giving a brief chronology of significant events. During the 1960s and much of the 70s, much of the Nam Songkhram Basin was a theatre of ideological conflict and armed insurrection, chiefly between communist forces and those of the US-backed state-military complex. It is no coincidence that the young Marxist poet and historian Jit Phumisak was killed in 1966 while supporting villager rights in the Phu Phan hill range of Sakhon Nakhon and the Communist Party in Thailand formed its first base in the same upland forests nearby to the location where the popular local politician

Khrong Chandawong13 was executed in 1961 (Baker and Phongpaichit, 2005). By the same token, it is also unlikely to be coincidental that the slopes of Phu Phan were chosen for a royal palace and much store was spent on developing the rural infrastructure of the more remote parts of the Nam Songkhram Basin, as direct means to counteract the perceived threat posed by communism spreading in the region. Roads, bridges, schools, health centres and irrigation schemes were built not only for the sake of "development", but as a means to win over the hearts and minds of the people from left-wing ideological tendencies.

In the words of Baker and Phongpaichit (2005:180), "The alignment of army, palace and business concluded by Sarit under US patronage in 1957-58 benefitted all parties. The US secured a base. The monarchy revived. The generals enjoyed power and profit. Business boomed. But these gains did not come without costs, and without releasing new social forces."

US military bases were established in Nakhon Phanom and Udon Thani to expedite the Indochina War, "friendship highways" were built between strategic cities and the newly-formed American funded Accelerated Rural Development Office (ARD) built two thirds of the feeder roads for the growing network in the Northeast (Bello et al, 1998). Forests were cleared, cash crops were planted, natural resources became commodities, the countryside was linked with the cities and people became far more mobile in the headlong rush to develop.

It could be argued that the relationship between the bureaucracy, monarchy, business and military has remained as the principle most powerful institutions shaping decisions over water and natural resources management in large parts of the Nam Songkhram Basin, with civil society or people's movements only having agency in relatively localised areas overall during the past decade or so. While the balance between these powers has shifted constantly and the phenomenon of "money politics" has become a prominent force shaping decisions at all levels from national down to local level, essentially real decision-making power over major water infrastructure projects has remained concentrated in the hands of relatively few at the top. This is not to imply that local stakeholders cannot influence decisions made over individual projects, as they clearly can in the case of delays to and the 2002 cancellation of the Nam Songkhram Project and return of Tung Pan Kan to the villagers of Ban Dong San, but it does imply that the state is still reluctant to let resource users have a significant say in large projects, such as the two dams with no purpose across the middle Songkhram and the Water Grid project which is being planned away from public scrutiny, driven largely by political ambitions and opportunities for personal enrichment.

To further understand the dominant role that the irrigation sector has played in the Nam Songkhram Basin, at the expense of other water users, one only need look at the largest irrigation system constructed in the Basin to date – the Lam Nam Oon Irrigation Project in Sakhon Nakhon. It was constructed between 1967 to 1981, although operations actually began in May 1974 (Royal Irrigation Department, 2003), it was clearly a very slow process in getting the system fully "operational". The Lam Nam Oon Irrigation Project was part financed by the Thai government and

[13] Khrong Chandawong and fellow social activist, Thongpan Suthimat were executed by military firing squad in a paddy field next to a disused, ex-Seri Thai airfield in Sawang Dindaen Dsitrict, Sakhon Nakhon province on the direct orders of Prime Minister Sarit Thanarat on 31 May, 1961, having both spent the previous five years in jail (Baker and Phongpaichit, 2005:174).

USAID, which according to the Royal Irrigation Department (2003) supported two development projects in the 32,000 ha command area:

- 1978 – 1985 Integrated Rural Development Project involving cooperation of eight departments in four ministries with the objective of increasing agricultural production yields leading to higher living standards
- 1987 - 1991 Promotion of an Agro-Industrial Project with the objective of encouraging permanent cooperation between farmers and the private sector. Contract farming was the favoured model.

The latter project was considered a great success, according to an USAID evaluation in 1993-94 (Dolinsky, 1995). According to their statistics, agricultural output expanded nearly 25 fold and households participating in contract farming grew from 171 families in 1985 to 4,000 in 1993. The number of agribusiness firms operating grew from three in 1985 and peaked at nine in 1991, before declining to eight in 1993, with production centred on vegetables and tomatoes for processing (some being sent to Sun Tech's Sri Songkhram factory) and flower seeds for export. The USAID report believed that prospects for growth of agribusiness were favourable because, "the quality of Lam Nam Oon's water delivery is a magnet for

Box 8. Lam Nam Oon Irrigation Project, Sakhon Nakhon Province

Agency responsible: Royal Irrigation Department (RID)

Project type: storage dam and reservoir, with gravity-fed irrigation scheme

Project objective: irrigation and flood control

Construction period: 1967 - 1981

Head works

Drainage area: 1,100 km^2

Reservoir Area: 85 km^2

Retention level: 185 masl

Reservoir storage capacity: 520 MCM

Dam height: 29.5 m

Irrigation system

Total command area: 200,800 rai (32,128 ha)

Total irrigable area: 185,800 rai (29,728 ha)

Rainy season irrigated area: 200,800 rai (32,128 ha)

Dry season irrigated area: 10,000 – 26,000 rai (1,600 – 4,160 ha)

Water supply consumed in dry season: 70 – 100 MCM

No. of households with land in command area: 20,551 h/h

Annual O & M budget: 43.211 – 60.863 million baht

(Source: Royal Irrigation Department, 2003)

agribusinesses, the farmers now have technological expertise, and the local environment is pro-business." The study estimated that small farmer incomes had nearly quadrupled between 1986 and 1993 and that women and landless farmers benefitted too, through increased employment opportunities. The only real concerns expressed were about the liberal use of pesticides and the public sector's tendency for "social service orientation" rather than "a more business oriented one" (Dolinsky, 1995).

Since 1991 the Lam Nam Oon project has been fully funded and under the administration of the Royal Irrigation Department, who state that the main objectives are (Royal Irrigation Department, 2003):

- Store water and distribute to cultivated land
- Solve the problem of water shortage either in dry season or in drought
- Alleviate flood disaster in the Nam Oon Basin, Huai Pla Hang Basin and lower Songkhram River.

It would appear that the objectives of the earlier USAID supported project component which stressed villager livelihoods and agribusiness promotion and RID's present objectives which are of a hydrological control nature do not correspond. Water storage and distribution while solving "floods and droughts" still are the primary goals and these are firmly the remit of a highly centralized state bureaucracy with little apparent accountability to its main constituents, the farmers themselves. Hence, it was not surprising for me to observe parts of the command area in the 2007 dry season and see very little of the available irrigable land being utilized for agriculture, despite apparently plentiful and free water14. This situation was confirmed by Thierry Facon of FAO who has previously conducted training for RID at the Lam Nam Oon project and noted that dry season cropping is only 5 - 10 % which is below potential water availability and that the system exhibits "results typical of systems in Thailand: poor control and service." (Thierry Facon, email to LaoFAB web board, posted 25 December 2008).

As for local or water users participation in the management and decision-making process, this would appear to be still lacking at Lam Nam Oon, as well as most other state-owned and operated irrigation systems. Although Water User's Groups and Associations have supposedly been created at Lam Nam Oon, their role and importance in the overall scheme of things would appear to be minor (Royal Irrigation Department, 2003). From a case study based in northern Thailand, Neef (2008) found that despite new rhetoric espousing more inclusive and participatory approaches to water management, local experiences were quite different with even some recentralization of water governance responsibilities. He concluded that "State-driven participatory processes tend to remain episodic and ceremonial and have not (yet) gone beyond the informative and consultative stage." Similarly, Molle and Floch (2008) observed a similar disregard for participatory and transparency principles in their examination of the decision making process used for the so-called "Water Grid" project, both from DWR and RID who were both putting forward draft proposals for similar pan-Isaan irrigation projects during the Thaksin regime. This view would correspond with my own impressions of state-led water governance in the Nam Songkhram Basin and the dominance of these two hegemonic state agencies over decision-making.

But even more illuminating, beyond the RID's (and DWR's) pre-occupation with "solving" droughts and floods, is the fact that so few farmers utilize the abundant and free water from what had been classed in 1990 the "Outstanding Irrigation Project in all of Thailand" (Skogerboe and Merkley, 1996) and portrayed as a resounding success story by Dolinsky (1995). If drought and lack of access to water

[14] In Thailand, irrigation water from RID controlled projects is ostensibly provided to farmers for no charge, with capital costs and O & M costs being met by the state as a public subsidy.

are the principle problems facing Isaan farmers and holding back agricultural development, as the dominant state-led narrative has long maintained, then why do relatively few farmers take advantage of the heavily subsidized irrigation opportunities presented by Lam Nam Oon Irrigation Project and what does this imply for the chances of success of future irrigation projects? While this paper does not seek to answer this question directly, the implications of Lam Nam Oon's apparent failure to become a sustainable project after 40 years of investment by foreign and state institutions, inform and influence many arguments put forward in this paper about where power over water resources allocation still lies. To a certain extent, this also links well with the unanswered question about why RID still continues to push for the Nam Songkhram Project and its smaller sub-project, the Nam Oon Watergates Project, while Sun Tech Group and its successor seem to be miraculously protected from free market forces to continue to operate in business long after effective bankruptcy and continue to hold rights over vast swathes of floodplain wetlands.

Actors and Institutions

Thus far the report has mainly unpacked the roles and interplay of the major actors of relevance to the case studies considered. Some actors have been more prominent than others and there has been two main discernible trends witnessed over the last 50 year period:

1. An increasing diversity in the influence of and roles played by state agencies over time, especially since the far reaching bureaucratic reorganisation of 2002, with several key players being absorbed into other institutions (e.g. ARD and DEDP) and several new institutions entering into the arena of water resources decision making (e.g. DWR, ONEP and DEQP). At the same time, certain other key agencies such as RID and the Fishery Department appear to have been largely immune to serious change during the last few decades. The goals and remit of these various water related agencies are quite different and the opportunities for integrating their work at the Basin level are still surprisingly few.
2. An increasing role and influence of civil society and peoples organizations (e.g. PER, TERRA, Nam Songkhram Basin Conservation and Rehabilitation Club) often working in close cooperation and stemming largely from a response to the ecological and livelihood threats posed by the Nam Songkhram Project (Case 1) and agribusiness expansion (Case 2) in the LSRB.

There is also clearly a growing realization that water resources management is far more complex than just a matter of supplying water for irrigated agriculture and meeting other demand from domestic consumption and limited industry. The needs of other water users such as fishers, wetland harvesters and rainfed landholders (the vast majority) have not been adequately recognised in the past, and therefore their voices have not been heard. There was neither the mechanisms nor the political will to seek more broad-based representation from a wide constituency of water consumers. The environment and ecosystems were also very much fringe concepts, with little money or interest shown in them by most state agencies until recently. This pattern has started to change in the last 5-10 years, with projects like the MWBP helping to raise the profile of multi-stakeholders, promote participation in wetlands management from national to local levels and trial new and innovative tools and processes. At the same time, academic and research interest in the biologically diverse and productive wetlands ecosystems has burgeoned in recent years, with several regional and national educational institutions getting involved in projects in the LSRB. A selection of the key actors and institutions involved in water management aspects across the Nam Songkhram Basin are presented in the table 3below. For a more exhaustive list of state institutions, the reader is referred to Table 13 (p. 70) in Blake and Pitakthepsombut (2006a).

Table 3. Main actors and institutions relevant and active in aspects of water management of Nam Songkhram Basin.

Type of Institution	Main location	Period	Role/s
Regional inter-governmental • MRC	LSRB	2000 - present	Fisheries co-management & Basin Development Plan
National state: • ONEP	LSRB	2002 – present	Wetlands policy & planning (Ramsar Convention). National state partner agency for MWBP
• DWR	Basinwide	2002 – present	Water resources management & planning (host for Thai National Mekong Committee). Multiple dam & dredging projects
• Dept of National Parks, Wildlife & Plants	Phu Phan National Park & Bung Khong Long Non-hunting Zone / Ramsar Site	2001 – present	Manage & conserve wetlands within protected areas. Regulate the use of national parks and protect wildlife habitats.
• Dept of Environmental Quality Promotion	LSRB (Ban Dong San)	2002 – present	Promote & enhance environmental awareness & education, working with local groups
• Dept of Pollution Control	Basinwide		Prevent & control pollution of all forms from all sources
• Dept of Fisheries	Basinwide	?	Manage & conserve fishery areas. Enhance fishery productivity and promote aquaculture. Conduct research.
• Royal Irrigation Dept (RID)	Basinwide	Last 50 years	Develop water resources and manage supply for various purposes. Holder of Nam Songkhram Irrigation Project.
• Harbour Department	Mainstream Nam Songkhram	Last 50 years	Maintain & protect rivers for use as transportation
	Basinwide (land		

• Agricultural Land Reform Office (ALRO) • Land Development Department • Local Administration Organization • Office of the Supreme Command • DEDP • Accelerated Rural Development Office	settlement sites) Basinwide Basinwide Basinwide Across Basin's lowlands Upper Nam Songkhram Basin	Last 50 years 1976 – present 1963 – present ? ? Late 1980s – 2002 1970s - 2002	routes Ensure adequate water provision at land settlement sites Combating land degradation, salinisation and desertification. Develop soil and water resources to increase productivity. Developing water resources locally. Ensuring wetland management and resource protection. Implementing water resources development projects, especially royal-initiated projects or on military owned lands. Original implementer of Nam Songkhram Project. Promoting electric pumped irrigation projects. Developing water resources in the upper basin
Local state • Provincial Offices of Natural Resources & Environment • Provincial Agriculture and Cooperatives Offices • Tambon Administration Organizations (TAOs)	Basinwide Basinwide Basinwide	2002 – present ? 2000 - present	Oversee & coordinate provincial natural resources & environmental strategies, incl wetlands Developing and promoting sustainable agriculture systems Local natural resources management and water resources development
Academic / Research • Khon Kaen University (various faculties and departments)	LSRB LSRB	Mid-1990s – present 2004 – 2007	EIA preparation for Nam Songkhram Project in late-90s. Various bio-physical and socio-economic research projects since. Cooperation with MWBP. Water quality testing in

• Mahasarakham University (Walai Rukavej Botanical Research Institute) • Mahidol University (Environmental Science Faculty) • Sakhon Nakhon Rajabhat University	LSRB LSRB	1992 – present ?	schools, in cooperation with MWBP. Biodiversity research and training for local communities. Multi-disciplinary wetlands research and local training Socio-economic research and community development
International NGO • World Wildlife Fund • IUCN – Asia Regional Office	Bung Khong Long Non-hunting Zone / Ramsar Site LSRB (esp. Sri Songkhram district)	2006 – present 2003 - 2007	Wetlands management and wildlife conservation Implementing MWBP – raising awareness of wetlands management issues. Trialing novel approaches to wetlands research and management, through working with broad cross-section of LSRB stakeholders
Local/national NGO • PER/TERRA	LSRB	1995 - present	Raising awareness of natural resource management issues and advocacy for local communities. Building resource user networks
Grassroots • Nam Songkhram Basin Conservation and Rehabilitation Club • Tai Baan Research Network • Songkhram Basin Network for Ecological Conservation & Recovery	LSRB (30 communities) LSRB LSRB	1996 – 2003 2003 – 2007 2008- present	Local people's movement, raising local awareness of state-led and agribusiness development projects Resource users network, started under MWBP in 4 key villages, linked into national Tai Baan Research Network. Local Ecological Research and wetlands conservation activities Continuation of activities and core group from Tai Baan

• Nakhon Phanom Environmental Conservation Club (NECC)	LSRB	?	Local civil society group working to promote environmental awareness and eco-tourism in Nakhon Phanom Province. Partner with MWBP
Business • Sun Tech Group Public Company Ltd • Northeast Agricultural Investment Company (NAICO) • Salt producers	LSRB LSRB Various locations in middle Songkhram Basin	1988 – 2007 1984 – 1998 Last 50 years +	Agribusiness activities – large scale, intensive agriculture; agro-processing and contract farming. Agribusiness activities – large scale, intensive agriculture; agro-processing and contract farming. Extraction and simple processing of salt, using boiling and evaporation ponds

Discourse and narratives

"*According to the two major problems [which] annually occur in this area, flooding for 2 – 3 months in the rainy season and lack of water in the dry season, farmers have to capture water during flooding for utilizing in dry season*." (Source: Chutiratanaphan and Patanakanok, 2001)

The author would argue that state and popular discourses have consistently portrayed the regular, seasonally occurring drought and floods (i.e. the flood pulse) in the Nam Songkhram Basin as "natural disasters", downplaying both the human-induced dimensions or the relative and contextual elements associated with these loaded terms. Both terms have been closely associated as being causative agents of poverty and the belief created by dominant "hydro-hegemons" that they can be controlled or even eliminated by human engineering interventions in the hydrological cycle are evident in state produced reports (e.g. Khon Kaen University, 1997; Royal Irrigation Department, 2003; Department of Water Resources, 2004). Lebel et al, (2005) has claimed that the Thai state has frequently manipulated or manufactured narratives of water "crises" (whether floods or droughts) to create space that allows the opportunity to introduce new water infrastructure projects to help stave off the flood or drought "disaster". This tallies well with the "manufacture of popular perceptions of scarcity" notion in Gujarat state of India, referred to by Mehta (2001). It also perpetuates the environmental myths embodied in the justifications given for large state-led water infrastructure projects (such as Nam Songkhram Project or the Water Grid) to turn a poor, parched Isaan into a rich, irrigated, fertile region that are described by Molle and Floch (2008) as "desert bloom syndrome". They argue that political ambitions, nationalistic hubris and popular modernization narratives tend to overpower more objective analysis of social and bio-physical constraints to such projects.

Table 4. Contrasting narratives of water governance and their main proponents found in the Nam Songkhram Basin.

	Main lines of argument	Main proponents
Orthodox or dominant narratives	• Floods and droughts are the main water resources problems or "crises" and should be considered "natural disasters" • Floods and droughts can be solved by using engineering solutions to intervene in the hydrological cycle • People are poor because they have insufficient irrigation water • Most rural people are rice farmers • Fisheries are declining due to overpopulation, overfishing and damaging fishing practices by local people • Local people lack scientific knowledge about natural resources management and therefore are unable to adequately manage the environment without state intervention	• ADB; WB; DEDP; RID; DWR; some other powerful state agencies; popular media • Most state agencies • Most state agencies • Most state agencies • Dept of Fisheries and other state agencies • Most state agencies
Alternative or counter narratives	• Floods and droughts are part of a natural seasonal cycle and should not be considered "problems", but normal events • Top-down, engineering solutions do not solve the problems, but create new problems of their own • People are poor not because of lack of water supply, irrigation or drought, but because of a range of complex inter-connected social, economic and political factors • Most local people engage in a range of livelihood activities, including farming, fishing and utilization of forest and wetland resources • Fisheries are declining due to environmental degradation and commercialization of fisheries • Local people possess a wealth of	• NGOs and civil society organizations • NGOs and civil society organizations • NGOs, civil society organizations and some state agencies • NGOs, civil society organizations and some state agencies • NGOs, civil society organizations and elements within MRC & DoF • NGOs, civil society organizations and

	local knowledge which is more relevant to natural resources management than scientific knowledge	some state agencies

Table 4 above shows not only that there are strongly contrasting narratives relating to water resources management and development, but that different forms of knowledge are keenly contested. At its most simple, these dichotomous groupings can be portrayed as "local knowledge" versus "scientific knowledge" with each side claiming legitimacy for its claims to "truth". In reality the claims and counter-claims are not always as black and white as this, and there is much middle ground in between the extremes. However, reading the popular English and Thai language press it would sometimes be hard to believe and dominant narratives are endlessly repeated. It is not uncommon to read news or commentary articles which repeat the popular environmental myth of Isaan as a "dry and infertile region" (e.g. Prateepchaikul, 2003).

Similar debates between contested claims over local and scientific knowledge have been made concerning the subject of Mekong fisheries by various observers in recent years (e.g. Hirsch, 2004; Sneddon, 2007). While I do not wish to repeat these complex debates over competing fisheries knowledge in detail, despite their importance to the wider Mekong water governance debate, suffice to say that they exist too in the Nam Songkhram Basin and were very much part of the rationale behind much of the Tai Baan Research Network's[15] research focus. While some might like to paint local knowledge and scientific knowledge as two ends of a spectrum and there is very little common ground in the middle, they are in fact not that dissimilar and "conventional" fishery scientists in the Mekong region had seen the benefits of and been using local knowledge since before the advent of the Tai Baan Research Network. For example, the MRC Fishery Programme had been accessing local fisheries knowledge for information concerning fish life cycles and ecology, particularly in relation to migrations and spawning sites, since 1997 (Valbo-Jorgensen and Poulsen, 2000). However, the debate was not just about the production and validity of different forms of knowledge, but also about ownership of that knowledge. This point relates directly to the "politics of fisheries knowledge" implicitly recognized and teased apart in the papers by Hirsch (2003) and Sneddon (2007).

Hence, when IUCN in preparation for the MWBP Demonstration Site project started engaging with local state agencies, NGOs and communities in Nakhon Phanom around 2002-03, they found there was a strong desire for local resource users to conduct their own research into local livelihood-environment linkages. Villagers that had been involved in providing information to previous research, whether for EIA studies, MRC fisheries programme or academic research complained that the data they provided was always taken away and never fed back to the community. Hence, they were suspicious about how the information might be used to justify large projects which did not benefit them or destroyed local resources and were reticent

[15] Tai Baan Research (or in Thai language *ngan wijai tai baan*) literally means "villager research", and refers to a local initiative to empower riverine-based communities to research, record and share the results of their own research on local livelihoods and ecology. While the concept started in Northeast Thailand, it has since spread to other regions of the country and Cambodia as well, adapting to local socio-cultural conditions at the same time.

about joining new research efforts. At the same time, certain provincial and district state agencies looking for new roles following bureaucratic restructuring and ways of engaging with the newly empowered TAO's with responsibility for management of local natural resources, saw potential opportunities in supporting novel grassroots research methods. Added to this was the apparent success of Tai Baan Research in providing sound data on fisheries and natural resource-based livelihoods at Pak Mun and Rasi Salai on the River Mun in southern Isaan and a burgeoning interest in indigenous knowledge nationally. Out of this background, emerged the Tai Baan Research Network in the LSRB which was essentially active during the lifetime of the MWBP presence in Sri Songkhram District i.e. 2003 – mid 2007 (see Blake and Pitakthepsombut, 2006b; Scurrah, in press).

The main appeal of Tai Baan Research is that it not only puts the local resource users in control of the research process and allows them to decide on the design and topics of the research focus, but it also keeps the results of the research in the hands of the local people, thus ensuring ownership and legitimacy in the eyes of local people. Outsiders participated in the research, but as facilitators termed as "research assistants" (Scurrah, in prep). As such it helped all parties to better understand the local society-nature links by experiential learning and in theory, should allow for more informed decision-making over natural resources management both at the local and higher levels. It held the promise of participatory action research which could give voice to wetland users' concerns at previously inaccessible fora and reduce opportunities for environmental conflict by improved knowledge of the local natural resources base and livelihoods. The two reports published and feedback workshops organized for interested persons and external stakeholders to learn about the research were well received and there was evidence the findings were widely respected amongst local, provincial and national state agencies (Blake and Pitakthepsombut, 2006b)

Apart from Tai Baan Research, a number of other innovative tools and processes were trialled in the LSRB during the last decade or so (see Table 5), mostly under the umbrella guidance and funding provided by MWBP, with the exception of the last item, which was an exchange seminar funded by the Department of Environmental Quality Promotion (under MoNRE) and attended by a broad range of LSRB stakeholders from the state and non-state sectors in April 2004 (DEQP). The title of the seminar was "The Nam Songkhram Communities Way of Life. Seminar to Propose a Natural Resources and Environmental Management Plan by the Communities of the Lower Nam Songkram Basin". Local resource users from about 30 communities played the key role in explaining their hopes and concerns related to natural resources and local livelihoods. A report was published (in Thai) and widely disseminated. It is significant in that it proposed a vision of natural resources management, including water, that was significantly different from the dominant hegemonic state agencies' vision, embodied by such projects as Nam Songkhram Project and the Water Grid. It emphasized local planning and management initiatives at the community level and rejected large pan-basin projects, adopting the subsidiarity principle. However, all indications are that this document was not widely adopted as a point of reference and the lessons contained within not acted upon.

Table 5. A selection of some of the main innovative tools and processes trialed in the Nam Songkhram Basin in last few years, mostly related to wetlands management goals.

Some innovative Tools/Processes observed in	Key features	References

Nam Songkhram Basin		
Tai Baan Research	• Participatory action research • Situated research with high local ownership • Links ecosystem & livelihoods explicitly, using indigenous knowledge • Good acceptance of results from state agencies • Empowers local community	Thai Baan Research Network of the Lower Songkhram Basin, 2005a Blake and Pitakthepsombut, 2006a and 2006b Scurrah, 2009
E-Flows study	• Multi- and trans-disciplinary approach to research • Involved wide stakeholder consultation pre- and post fieldwork • Targeted at understanding ecosystem-livelihood linkages at seasonal hydrological extremes • Utilized Multi-Stakeholder Dialogue at end of process	Dyson et al, 2003 Blake et al, forthcoming
WIAM biodiversity studies	• Multi-scalar approach to wetlands research • Identifies key wetland sites of importance • Rapid appraisal techniques of biodiversity • Assesses suitability for Ramsar designation	
Water quality testing in schools	• Low cost, participatory technique for environmental monitoring and result sharing • Led to establishment of schools	Walai Rukavej Botanical Research Institute, 2007

	conservation network, still active today	
State-civil society seminar on natural resources management and environmental planning	• Multi-stakeholder platform	DEQP, 2004

VI Current status of the decision-making process and its trajectory

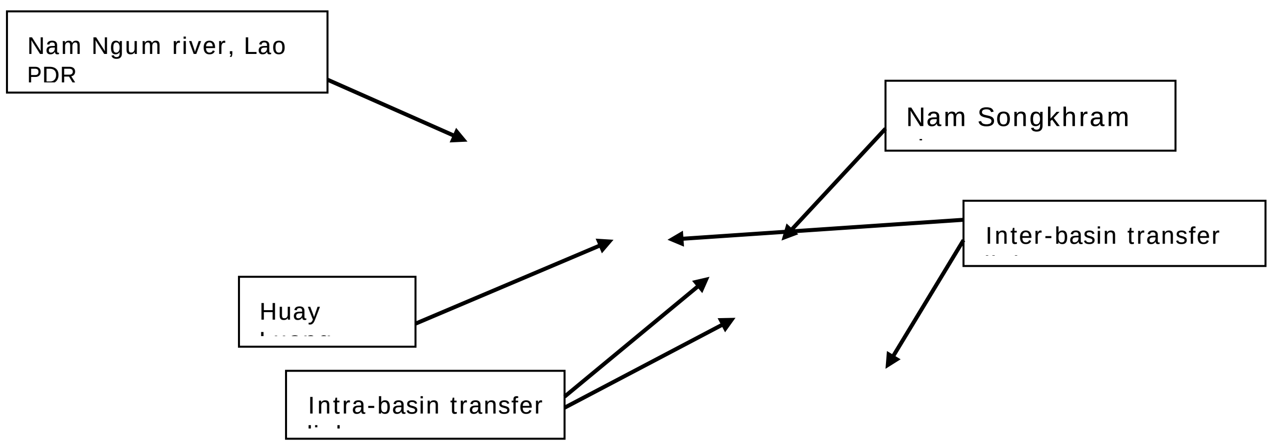
"*Farmers' inaccessibility to the irrigation system is a major cause of poverty. The integrated irrigation scheme would be a key measure to eradicate it*". Comments made by Somkid Jatusripitak to journalists, following a meeting with senior agricultural officials including Agriculture and Cooperatives Minister Somsak Thepsutin and deputy Minister Newin Chidchob on 9 January, 2004 in preparation for launching the Water Grid Project (Source: Samabuddhi, 2004)

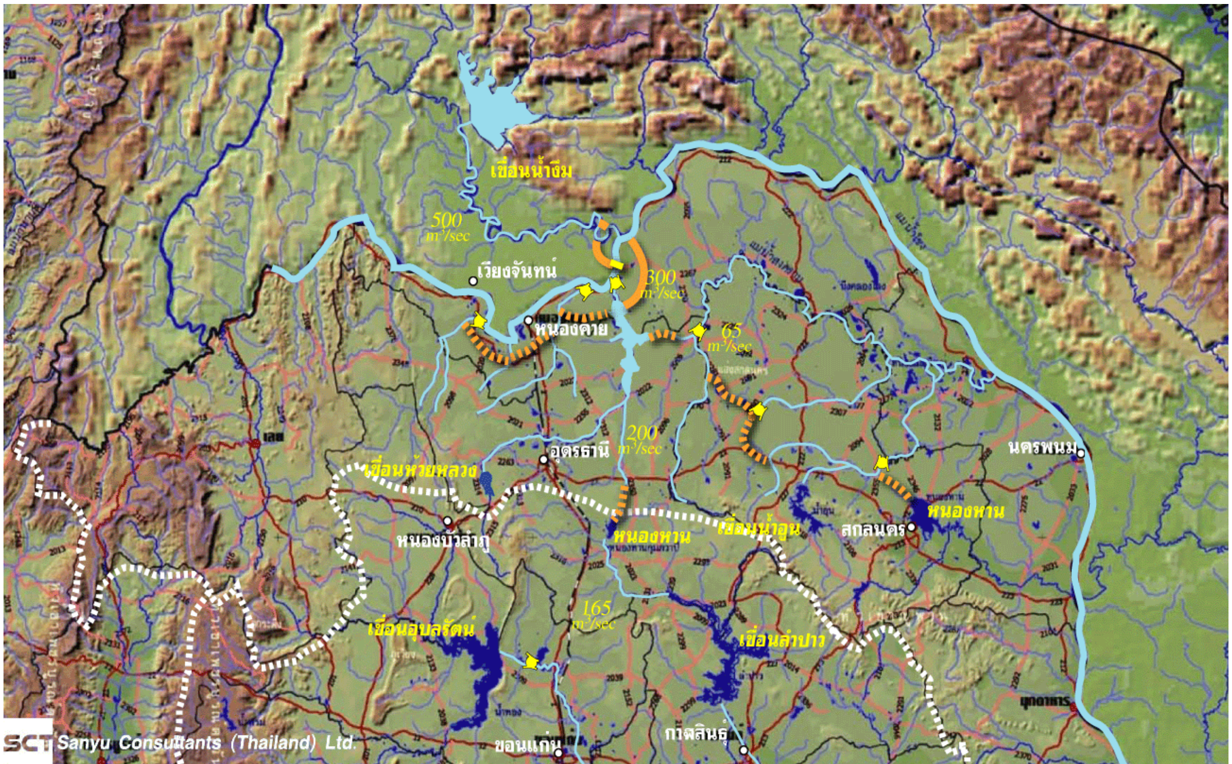
Water Grid Project and recent developments

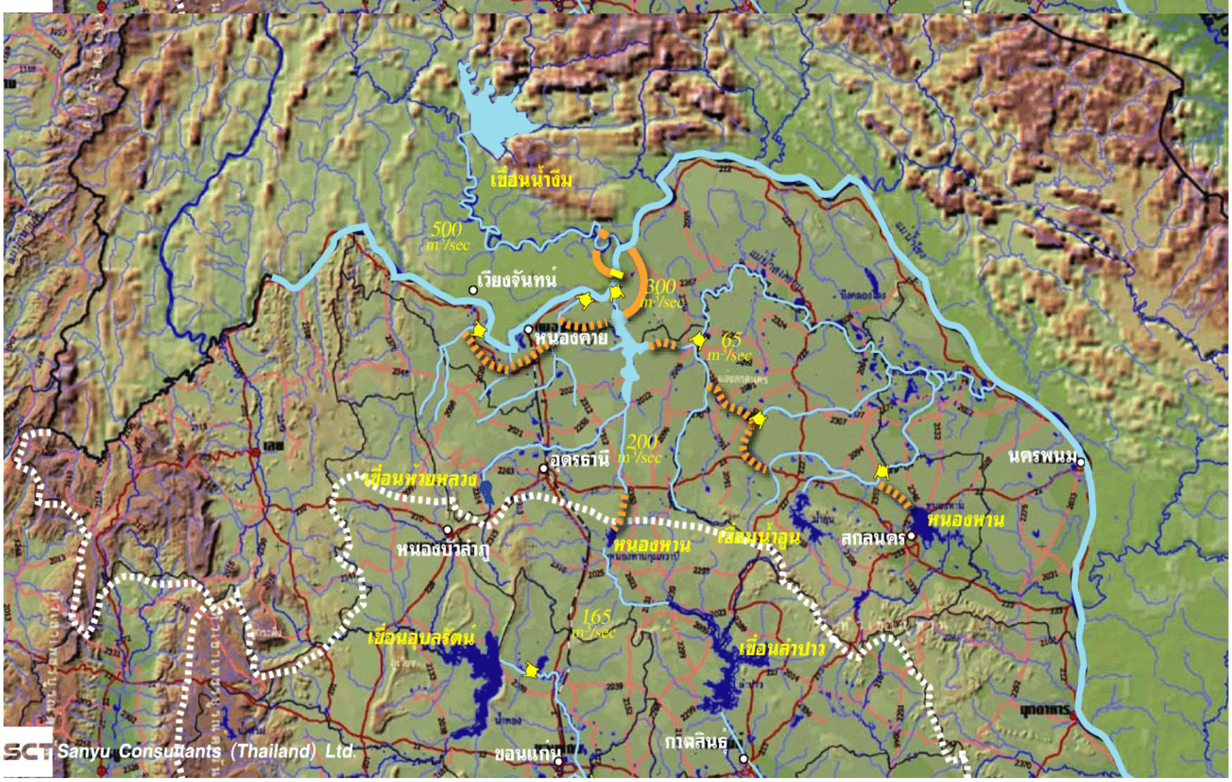
Since September 2006 and the ouster of Prime Minister of Thaksin Shinawatra, the political administration of Thailand has been marked by much instability and uncertainty. After a period of military rule up to elections in late December 2007, the country was turned over to a democratically elected government under Samak Sundaravej as leader of the People's Power Party which continued to have close associations with the Shinawatra dynasty. Thus it was no surprise that just several days after his appointment in February 2008 as Prime Minister, Samak announced the resurrection of several mega-projects started under the Thai Rak Thai government, including the controversial Water Grid Project (Winwong, 2008). The Water Grid Project includes eight water diversion projects from river basins in neighbouring countries with an estimated cost of 500 billion baht ($14.97 billion). Apparently, the Thai cabinet approved the first two of these schemes in July 2008, including the proposed diversion from Lao PDR's Nam Ngum River to the Chi-Mun Basin in Northeast Thailand via Nong Khai and Udon Thani provinces (Winwong, 2008). For an in-depth description of the Water Grid's chequered history and background, the reader is directed to the Ambio paper by Molle and Floch (2008). Here I will just concentrate on the aspects that pertain to the Nam Songkhram Basin.

The Water Grid project, if it proceeds, opens up the possibility that some of the water diverted from Lao PDR or the Mekong mainstream may be transferred from a reservoir proposed for the Huay Luang River in Udon Thani to the Nam Songkhram Basin as has been proposed in an early draft of the Water Grid Project seen by the author (Anon, 2005). The map below prepared by Sanyu Consultants (Thailand) indicates that 65 m3/s would be transferred (presumably in the dry season) into the Middle Nam Songkhram Basin for irrigation purposes. There are other transfer lines on the map indicating plans to move water from the Upper Songkhram to the Nam Yam tributary basin, water from the Nam Yam to the Nam Oon tributary basin and water from the Nam Oon to the Nam Gam basin via Nong Han lake in Sakhon Nakhon Province. Such inter-basin transfers would require massive engineering works at great cost and much social and environmental impacts. All the areas proposed for water transfer are known areas of high soil salinity. No feasibility study or cost-benefit analysis has been seen and it is unclear if any of these plans have been released into the public realm yet.

Figure XX. Map showing elements of proposed Water Grid Trans-basin transfer scheme in upper Northeast Thailand (Source: Anon, 2005)







The Water Grid project proposes to move water between basins and locations by means of a network of pipes, maintaining that these are more efficient than canals and less environmentally and socially disruptive, as they require less land. The Murray-Darling Basin in Australia is often quoted as a model to follow by Water Grid proponents, such as the Khon Kaen politician and past Minister for Natural Resources and Environment and Deputy Prime Minster during the Thaksin regime, Suvit Khunkitti. In December 2008 he was reappointed to the position of Minister of Natural Resources and Environment in the Democrat coalition government (The Nation, 2008). If the Water Grid Project proceeded, it would inevitably entail the expansion of irrigated agriculture across the Nam Songkhram Basin, despite the lack of evidence that there is any real demand for such amongst ordinary villagers and even less willingness to pay for water (as evidenced by the case of Lam Nam Oon). Furthermore, a key goal of the Water Grid's rationale (apart from the usual platitudes to reduce water shortage problems and poverty) is to promote agribusiness and in particular, contract farming, using agricultural extension methods described as "aggressive on-farm visits" (see Box 9 below). It would seem

Box 9. Steps to accomplishing poverty eradication in Northeast Thailand by the Water Grid Project, according to proponents (Source: Powerpoint presentation given at Research and Development Institute, Khon Kaen University, February 23, 2005)

1. Distribute water by pipes, canals, etc. from sources to required areas.
2. Promote farmers to grow high value crops and manage water distribution through:
    a) Farmer Capacity Strengthening
    b) Seeds, bionic farming and irrigation techniques
    c) Formation of farmer organization for O&M of lateral pipes (Main pipes by private sector) and for dealing with SPV
    d) Meter and charge for delivering water
    e) Provision of start up fund
    f) Link with other government programs: World Kitchen, OTOP, SME, Village fund, etc.
    g) Agricultural extension by aggressive on farm visits
3. Create private company (SPV like) for local & international marketing
    a. Contract Farming
    b. Brand name building
    c. Cooperation with other countries

that the possibility of the Water Grid Project becoming another massive public subsidy programme to provide cheap water and opportunities for corporate agribusiness interests and political graft are all too likely.

While the probability of the Nam Songkhram Project in its original form proceeding in the near future do not seem likely, there would appear to be concerted moves by the RID in cooperation with local business and political interests to move forward the smaller Nam Oon Watergates Project. There would appear to be some support too from local TAO's, although their support may be fickle if it is not perceived that they will get a reasonable share of the construction contract benefits available from such a large project or the possibility that local voters may be divided as to the perceived benefits. Hence, this project should be watched for signs of being resurrected by local civil society groups concerned about potential social and environmental impacts to a sensitive part of the Nam Songkhram floodplain. Interestingly, a hydrological survey carried out by WUP-FIN of the MRC as part of the MWBP E-Flows study found that any floodgates built at the proposed point would have negligible benefits for flood control, because of the overriding influence of the Mekong mainstream on Nam Songkhram flood levels (Blake, 2009).

Another project that has been discussed in the press from time-to-time and amongst government officials during various meetings the author has attended in Northeast Thailand, is the possibility of digging large on-floodplain lakes with bunds around them to capture floodwater during the rainy season and utilize it for agriculture in the dry season. This method of "flood control" has gained uncritical support, as it is a water resources technology recommended by HM The King for holding floodwater in artificial ponds (termed "Monkey Cheeks Project" or "*Kaem Ling*") to be built along the Chao Phraya delta either side of Bangkok[16]. However, it seems like certain government agencies want to apply this method in river basins all over the country, even in the absence of a large conurbation, such as the Nam Songkhram Basin, which must surely bring into question the economic rationale of such a project. Added to which, the floodplain sites proposed for the *Kaem Ling* on the LSRB coincide with some of the last remaining areas of seasonally flooded forest (*paa boong paa thaam*) and are still important sites used for the gathering of multiple wetlands products, livestock grazing and dry season rice cultivation, all of which would be lost by such a development.

Other water resources developments that could have a profound impact on the LSRB are those planned for the Mekong mainstream and tributaries in other countries, especially Lao PDR. There are presently several large hydropower dams under construction on the mainstream in Yunnan, China, and many more under construction upstream on various Mekong tributaries in China and Lao PDR (e.g. Dore et al, 2007; International Rivers, 2008). These could negatively impact the Nam Songkhram Basin through three main pathways:

- Alterations to the mainstream hydrology changing the flood pulse characteristics in the linked Nam Songkhram system, thus altering the aquatic-terrestrial ecosystem balance
- Alterations to the geomorphology of the Mekong mainstream and changing the sediment-nutrient load of the river, having knock-on effects to the nature and fertility of the linked Nam Songkhram floodplain system.
- Alterations to the aquatic productivity of the Mekong mainstream through multiple impact pathways, reducing the migration of fish and other aquatic organisms into the Nam Songkhram system and harming the aquatic ecology and dependent livelihoods in both systems.

[16] A description of the fundamental principles of this project can be viewed at: http://ie.youtube.com/watch?v=ZNVR31_qCsY

Blake (2008b) in his chapter on the Nam Theun 1 hydropower project planned for the large tributary not far upstream from the Nam Songkhram confluence with the Mekong noted that the Nam Theun 1 dam is expected to lead to a decrease in wet season flows of 8 %, according to project documents. It is argued that even a small decreased in flows like this could have a disproportionately large impact on the area of floodplain inundated in the wet season due to the flat nature of the landscape, which would have significant knock-on effects on aquatic productivity in the Nam Songkhram Basin where communities are so heavily dependent on the fish catches off the floodplain at the end of the rainy season. Similarly, increases in dry season flows caused by upstream developments like the Nam Theun 1 dam or dams in China, will have predictable negative impacts on riparian vegetation and bankside agriculture that is dependent on naturally low dry season water levels. It should also be noted that villagers in the LSRB have been noticing unseasonal fluctuations in water level for several years, a phenomenon for which they could find no natural explanation and suspect upstream dam developments to be the cause (Tai Baan Research Network of Lower Songkhram Basin, 2005)

Agricultural development trajectories

Despite all the public and private investment sunk into agricultural development, especially irrigation and intensification of farming systems through the agribusiness model (see Case 2 and section on Lam Nam Oon Irrigation Project for example), it is instructive that farming in the Nam Songkhram Basin is still relatively unchanged and relying on essentially traditional patterns of farming i.e. smallholder using low external input systems. There are exceptions of course, but for the majority of households, farming occupies a limited and declining part of their livelihood strategies. This observation is not necessarily backed up by official state studies which still tend to categorise rural people through biased surveys which encourage enumerators them to put “rice farmers” down, rather than the more complex multi-component livelihoods that dominate in reality (Blake and Pitakthepsombut, 2006a). Increased mobility and better opportunities for income elsewhere have led to labour constraints and changing age structures in rural communities towards older people being left on the land, have taken their toll on farming in the Nam Songkhram Basin as elsewhere in Northeast Thailand. Rigg (2003:232) has pointed out the paucity of studies investigating the non-farm elements of the “agrarian” economy, even though it is relatively well recognized that diversification and risk minimization are common strategies of the rural population in Southeast Asia.

This is not to suggest that there are not a large proportion of rural households in the Nam Songkhram Basin involved in farming, but rather that the importance of it within the overall local economy tends to be over-empasized in official documents compared to other livelihood strategies, including those based on wetlands product harvesting and non-farm income, especially remittances sent back from family members working elsewhere but still registered locally. The agriculture that is practiced, can broadly be split into three main categories as follows, with perceived trends shown in brackets:

1. Traditional – low external input, low-risk, (but high labour requirement), rainfed and irrigated, subsistence, extensive systems (*Majority but slowly declining*)
2. “Modern” – High external input, high-risk, (but low-labour-requirement), irrigated, sometimes for export, intensive systems i.e. agribusiness-led (*minority & declining*)
3. “Alternative” – Organic or low agrichemical input, use of modern irrigation methods (on-farm) and understanding of plant and soil needs to restore and

build-up fertility. Integrated Pest Management. King's sufficiency theory agriculture & integrated farming (*minority, but steadily increasing*)

While there has been a definite trend of expansion of the agricultural frontier into remaining natural forest and wetland habitats in recent years observed by the author between 2004-07 and confirmed by GIS surveys such as those of Suwanwerakhamtorn et al., (2007), the rate of expansion is now severely limited by the relative lack of available land left to convert. In other words the agricultural frontier has nearly reached its limit. Most of the agricultural frontier expansion observed has for been for one of three purposes:

- Increase in area of land planted to monocrop eucalyptus plantations, including both reclamation of natural wetland habitat and conversion of agricultural land.
- Increase in area of land planted to monocrop rubber plantations, including expansion into upland natural forest and conversion of land formerly planted to cash crops on upland terraces.
- Increase in area of land planted to dry season rice, mostly on converted natural wetland habitats, including seasonally flooded forests on the floodplain.

The agricultural expansion on the floodplain appears to have been fuelled by three main factors:

- State policies encouraging the expansion of rice cultivation, dry season cropping and eucalyptus for pulpwood during the 2001-2006 Thaksin regime, coupled with the land- rush atmosphere created by the controversial "assets for capital" policy.
- Lack of state protection or clear policies for conservation of sensitive, vulnerable and biodiverse wetland habitats, such as *paa boong paa thaam* which is now highly degraded and limited in extent throughout its range, allowing local people to exploit weaknesses in land laws and claim ownership by agricultural conversion.
- A temporary rise in prices in some agricultural commodities between 2005-07/08, encouraging further expansion of the agricultural frontier in former common property regime areas, especially those under ALRO status.

Against this complex background where cultural, political, social and economical interests co-exist and act as agents of change, it is hardly surprising that there are any number of conflicts over natural resources and water management occurring at the local / community level and not just the basin and national levels, as has principally discussed up to this point. The author saw bitter struggles between factions at the community level transpiring during his time in Sri Songkhram District, often occurring between groups who seek to conserve the *paa boong paa thaam* and increase public conservation areas (including community forests and fish conservation zones), against other groups, often aligned with local political elites, who sought to convert the flooded forest to agriculture, introduce state-sponsored irrigation schemes and increase the area planted to eucalyptus and rubber plantations. Hence, understanding the dynamics of local conflicts is arguably as important as understanding the larger-scale conflicts, which could be a case for further unpacking the politics of scale. Lebel et al, (2007) have maintained out that examining the politics of space (including scale, position and place) is more helpful in understanding the dynamic processes driving water resources politics, than only "politics of scale". This paper has made a tentative start at this endeavour, although it has necessarily been selective in the overall range of cases examined.

The trend towards local people planting pulpwood plantations across the floodplain is problematic, especially for NGO's and civil society groups that have long campaigned against the proliferation of eucalyptus plantations when they were principally being planted by agribusiness, such as that of Sun Tech and Asia Tech Group on Tung Pan Kan (see Watershed, 1996; Guayjaroen, 2001). Now the planting is being done by local people voluntarily on their own land (often ironically grabbed also from common land), the arguments are not so straightforward as before. While the environmental impacts caused by eucalyptus plantations remain the same, it is not easy for a NGO to gain credence in a local community by campaigning on this issue. Even on Tung Pan Kan, villagers that struggled to reclaim the public land from Sun Tech are now planting new eucalyptus seedlings on the newly privatized land or in some cases, actively protecting remnant eucalyptus trees left from the Sun Tech plantation. Thus, I would argue that new ways are needed in understanding the underlying drivers governing natural resources management on the Nam Songkhram floodplain, which take into account all drivers involved.

A new alternative paradigm was clearly introduced through the MWBP approach to wetlands management, by putting ecosystems and livelihoods at the forefront of decision-making and trying to include a wide range of stakeholders in planning and management of wetlands at multiple scales (Blake and Pitakthepsombut, 2006a; Blake et al, 2009). For the first time for any institution, MWBP regarded the Nam Songkhram Basin as a single ecological unit, while focusing primarily on the wetlands of the LSRB, given the broad remit of the programme and encumbent staff and budgetary limitations. Through close coordination with a large number of state and non-state stakeholders from local up to national, it was able to convene a number of basinwide and provincial meetings around the common issue of wetlands management, which culminated in the establishment of a Nakhon Phanom Provincial Wetlands Management Committee (NPPWC) chaired by the Provincial Governor in late 2006. The NPPWC included representatives from all the major water resources-related agencies, plus a healthy number of non-state representatives including local resource users and allowed genuinely open and frank discussion about the major issues facing wetlands in the LSRB. While this Committee was not ultimately sustainable past the life of MWBP, it did for a time show promise in bringing together a broad range of actors for meaningful negotiation over water resources under a common platform. This was just one of a number of multi-stakeholder platforms convened by MWBP at the national, basin, provincial, district, sub-district and community levels during the course of the two and a half year project[17].

A future Ramsar Site?

Perhaps as a result of the increased attention focused on the LSRB as a wetlands of international importance[18] and growing recognition of the biodiversity and livelihood

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[17] Many of the project documents related to this project can be accessed through the MWBP website at: www.mekongwetlands.org or for a more critical analysis of impacts, refer to Blake et al, 2009.

[18] The "Nam Songkhram River" had already been designated a "Wetlands of International Importance" according to criteria laid down by the Office of Environmental Policy and Planning (OEPP) and listed in the National Inventory of Wetlands since 1998.

values attached to the wetlands ecosystems of the Lower Mekong Basin, in 2006 there was interest shown at the national level, specifically the Office of Natural Resources and Environmental Policy and Planning (ONEP) under the MoNRE, for proposing the LSRB as a potential future Ramsar Site. There was already one Ramsar Site within the Nam Songkhram Basin designated in July 2001, namely the Bung Khong Long Non-hunting Area, Nong Khai Province, on the upper reaches of the Nam Mao, a tributary stream of the Nam Songkhram River. However, Bung Khong Long is a modified seasonal lake and marsh system, that is relatively discrete compared to the much larger and more complex floodplain wetlands ecosystem of the LSRB, which is harder to define in terms of its geographical boundaries and ecological limits. Adopting the LSRB as a Ramsar Site would be far more challenging conceptually and practically, given strict resource limitations of ONEP. Therefore, following discussions between ONEP and the MWBP National Office, preliminary steps in completing a Ramsar Information Sheet (RIS) for the LSRB were conducted by MWBP / IUCN staff based at the Demonstration Site.

Using data collected during an earlier Wetland Inventory, Assessment and Monitoring (WIAM) protocol and other baseline data held by MWBP, the RIS was completed and sent to ONEP for further consideration in June 2007. It was decided that the LSRB wetlands do meet the criteria established by the Ramsar Secretariat on six points, as indicated in the table 6 below.

Table 6. Criteria by which the Lower Nam Songkhram Basin wetlands meet Ramsar Site standard criteria.

Criteria No.	Description	LSRB situation
1	A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region	
2	A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.	
3	A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region	
4	A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.	
7	A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity	

8	A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.	

VII Broad implications, challenges and opportunities

<u>Research Questions</u>

Q/ If the case is typical, what may be the replicability of findings to a number of places in the Mekong Region with more or less similar attributes and characteristics and context?

Q/ If it is atypical, what is the significance of the findings due to its criticalness, uniqueness and/or revelatory nature? What lessons does this case of decision-making convey to developments in the Mekong now or in the near future?

Q/ From this case, what might be the opportunities for other parts of the Mekong Region, for more constructive engagement in water allocation decision-making and finding?

Q/ What other research issues emerged that deserve further research attention?

Q/ what are current engagement/constructive intervention opportunities to overcome barriers, move past gridlocks and further improve water allocation decision-making, etc?

Broadly speaking, the Nam Songkhram Basin could be considered a fairly “typical” middle size river basin in the Lower Mekong Basin, in terms of its bio-physical conditions certainly although perhaps less-so socio-economically. While it is obviously less mountainous than most rivers found in Lao PDR and the Mekong east bank in Cambodia with a correspondingly gentler incline, the lower reaches of rivers such as the Se Bang Fai, Se Bang Hiang, Se Don and many of the major tributary rivers draining into the Tonle Sap are quite similar in nature to the Nam Songkhram. Several of these rivers also experience a marked backwater and occasional backflow effect from the Mekong mainstream’s influence in the same way that the Nam Songkhram does. Hence, the hydrology and aquatic ecology of these river systems can be broadly compared as sharing certain similarities. The socio-economic comparisons would be less strong, given the proportionately higher income, non-farm work opportunities, life expectancy, literacy rates, access to clean drinking water and other social development indicators found in Northeast Thailand compared to the neighbouring states of Cambodia, Lao PDR and Viet Nam. For example, rural poverty rates (% households) between 1997 – 99 were estimated to be Cambodia (39 %), Lao PDR (41 %), Thailand (22 %) and Viet Nam (46 %), according to data provided by The Mekong River Commission (2003). The range of livelihood strategies practiced and the high proportion of people still involved in exploitation of fisheries and wetlands-based livelihoods is high and possibly on a par with several of the other river basins mentioned in Lao PDR.

Within Thailand, however, the Nam Songkhram Basin especially its lower floodplain part could be considered atypical of other river basins, including the much larger Chi-Mun Basin that dominates the Khorat Plateau. This is nothing to do with the vast difference in size, but the fact that the Nam Songkhram still experiences a relatively healthy capture fishery based primarily upon migratory fish from the mainstream Mekong and has the unique to Thailand, massive annual rainy season floodplain inundation which ensures the aquatic productivity. This is both a function of its natural hydrological characteristics (no rapids as in the lower section of the Nam Mun) and the fact that the Nam Songkhram's hydrology has not been massively altered by dams, as with the Chi-Mun system along its entire length. While all the Nam Songkhram tributaries have water control infrastructure at several points along their length (from small weirs through to large dams like the Lam Nam Oon dam), the mainstream Nam Songkhram is presently without a dam along its lower 300 kms or so. In other words, the connectivity between the Nam Songkhram and the Mekong River is still functional, which is reflected in the high biodiversity and bioproductivity of fish catches, especially at the end of the rainy season.

Despite the unique (to Thailand) functional flood pulse and relative abundance of water resources and wetland habitat throughout the year in the LSRB, the basin is still tarred with the same "water scarce" label as the rest of the Isaan. For government agencies such as RID and DWR, few distinctions are made in water resources literature between parts of Nakhon Phanom or Nong Khai with over 2,000 mm rainfall/annum and parts of Chaiyaphum or Nakhon Ratchasima with less than 1,100 mm rainfall/annum. Both areas tend to get described as "semi-arid" or "drought prone" and proscribed the same solution of requiring further water storage required to provide water for agricultural and domestic consumption. At the other hydrological extreme, the Nam Songkhram is also considered by hegemonic state institutions such as RID and DWR as having a serious flood problem which even though it predictably happens annually for 2-4 months, has been dubbed a "natural disaster" and attracts compensation payments for inundated land. These twin "crises narratives" of consecutive floods and droughts has dominated popular discourse, when compared to alternative narratives surrounding the fertility of the wetlands and the natural hydrological regime stressed by NGO's, civil society groups and a few state agencies working in the area. Nevertheless, it is argued, the prolonged efforts to promote understanding of floodplain wetlands by MWBP and its partners and the Tai Baan Research Network, has helped to foster new understandings about wetlands ecosystem-livelihoods linkages which have challenged the dominant narratives (e.g. Blake, 2006; Blake and Pitakthepsombut, 2006b; Tai Baan Research Network of the Lower Songkhram Basin, 2005a). This was indicated by more balanced coverage in both the Thai language and English language media (e.g. Glahan, 2006)

There has been a forty year history of sustained state intervention in water resources management in the Nam Songkhram Basin, principally by one or two hegemonic actors, most prominent of which has been RID starting with the construction of the Lam Nam Oon Irrigation Project in 1967. At that stage of regional development, when there was still armed insurrection by communist forces in the area it is argued that the rationale was as much ideological as it was aimed at improving agricultural production. Indeed, this project was not fully operational for 15 years and only became a success in terms of increasing employment and raising income levels in the early 1990s, after sustained support from a USAID contract farming and agribusiness promotion project. However, the success was not sustained and it is understood that today dry season usage levels are not over 10 % of irrigable area and many agribusiness companies have left the area. The same is true of the LSRB where agribusiness involvement peaked in 1990-92, after which it experienced a steady decline due to internal and external factors, culminating in the closure of the last agro-processing plant in Sri Songkhram District in 2007. This saga of agribusiness boom and bust was dealt with in Case 2, but the narrative has not yet reached its conclusion due to the fact that the agribusiness in question – Sun Tech Group PCL – has reinvented itself with a new name and still holds title to vast land reserves on the Nam Songkhram floodplain. As other neighbouring countries appear to be following down a similar road of promoting agribusiness, selling off natural resources rapidly (often not to the highest bidder but the best connected), commodifying and privatizing many former common property resources, and entering into a brave new world of inter-regional and inter-global links; the case of the Nam Songkhram Basin could be particularly illuminating and instructive for interested actors externally. In many years, large parts of Cambodia and Lao PDR are at a similar stage of development with similarly healthy natural resources as the Nam Songkhram Basin had 30 – 40 years ago and face similar choices. Whether the lessons are learned, depends largely on the ability of key actors and decision-makers to acknowledge these links and similarities and being able to act appropriately to divert or mitigate the worst excesses. To follow the same pattern of development observed in the Nam Songkhram Basin, invites the real possibility of many more dams being built without a purpose and wide reaching impacts or previously healthy and life-giving wetland ecosystems being transformed into the kind of lifeless plains seen atplaces like Tun Mon in the dry season.

- This section will broadly argue that the Songkhram Basin could be considered “typical” of other river basins in the LMB, both in a bio-physical sense and socio-economically, BUT with some fundamental differences which will be pointed out and contrasted. For example, the “water poor” label common to descriptions of Northeast Thailand is hardly fitting to this massive wetland area where water scarcity is not a limiting factor for most floodplain villages for most of the year, but water abundance could be considered limiting to agriculture while favouring other livelihood activities such as capture fisheries. The geo-politics of the Basin are common to the other river basins of NE and Northern Thailand with a similar history of top-down, natural resource (mis)management and environmental degradation.
- Because of the relatively long history of state intervention in water resource management with both documented and anecdotal evidence of variable development outcomes, it will be argued that the Songkhram Basin can offer salient lessons for other river basins in Laos and Cambodia, which are at a similar stage of development to the Songkhram Basin some 20-30 years ago, just on the cusp of or in full throes of forest clearance, basin closure and agribusiness intervention.
- This section could unpack some of the National Water Policy, consider the degree with which it is being implemented, where there are contradictions, and how potentially it could be improved and more rigorously implemented to its original intent. The dominant role of the two Thai water management institution leviathans – RID & WRD – has to be considered in any analysis and what hope there is that they can be reformed to work for sustainable water management, rather than political interests and personal, short-term financial gain.
- Recommendations for potential and urgent research issues will be offered.

Conclusions

- The primary justification driving water resources development in the Basin has been providing irrigation water for agriculture as both a solution to the region’s “drought problem” and “poverty problem”. These meta-justifications have been consistently used by the dominant state agencies involved in water resources management throughout the last five decades and still underpin the stated reasons for pursuing the Water Grid and Nam Songkhram Projects. However, if one examines the success of existing irrigation projects for meeting their objectives one finds a long trail of over-stated benefits and unrealized ambitions from some of the smallest projects up to the largest. Especially the largest. This report has revealed just several examples through the case studies, but the case of the Upper Songkhram Project "weirs" at Ban Muang and Ban Nong Gaa which have still to irrigate a single rai out of the 48,000 rai claimed by the state or the Lam Nam Oon Irrigation Project held up as star performer in Thailand by the RID which only has 5 – 10 % utilization of potential irrigable area in the dry season are representative of the exaggerated claims made for irrigation potential. The reasons for failure are complex and many, but largely stem from popular perceptions of scarcity coupled with uneven power relations allowing single solution approaches to be applied without serious challenge.

- The Songkhram Basin is characterized by multiple actors working at multiple scales towards multiple objectives, often non-compatible due to fundamental differences in ideologies and worldviews. There has been a tendency in the past to simplify conflicts over water and natural resources into such dichotomous groups as local villagers and NGOs (= powerless) versus state agencies and private agribusiness (= powerful), when of course, reality is far more complex. Villagers are no more homogenous as a group, as are state employees and both incorporate a wide gamut of worldviews and ideologies. Yet, nevertheless there is still the temptation to clump local people living in communities as "villagers" or "peasants" or "farmers" when they could often spend part of their year living in a Thai urban area, part in their home village; be employed part of the time in industry, part in agriculture; be sometimes an employee, sometimes self-employed and sometimes an employer (e.g. during rice planting or harvest); be a rice farmer, fisher, labourer, livestock raiser, and gatherer of wetlands and non-timber forest products consecutively. In other words, many contemporary Thai villagers in the Nam Songkhram Basin as elsewhere in NE Thailand pursue multiple livelihood opportunities and are adept at moving between urban and rural lifestyles, as well as often taking jobs overseas in a wide range of countries. Yet despite these diverse occupations, as far as hegemonic state agencies dominant in the field of water management are concerned, rural people are portrayed as poor rice farmers in desperate need of irrigation water and state development projects, which is presently lacking due to drought and insufficient funding.
- Despite the national water vision and policy endorsed by the Cabinet in 2000 and efforts to establish River Basin Committees and implement IWRM nationwide (e.g. UNESCO, 2006), it is clear from the experiences in the Nam Songkhram Basin that these efforts locally fall far short of the ideals set in Bangkok. While UNESCO (2006) claimed that, "Planning process [sic] for each river basin has been done on a principle of grass root level participation through the RBC mechanism", first hand reports from colleagues active in various aspects of natural resources management and familiar with the local RBC suggested otherwise. They reported that the RBCs were anything but participatory or transparent, with little fundamental planning or debate over water resources planning and direction occurring, but more a process of vetting a shopping list of projects submitted by various state agencies and prioritizing them for implementation. These people, an academic, a wetlands conservation project manager and a community leader working at grassroots level were highly disparaging and skeptical of the value of the RBC process. Meetings were infrequent and described as "top-down".

- Large-scale water infrastructure projects proposed for the Nam Songkhram Project, such as the Nam Songkhram Project, have thus far failed to consider the trans-boundary impacts of the projects in question. Because the projects mostly involve damming the mainstream, thus acting as a physical barrier and altering the river's seasonal flows, there would inevitably be downstream ecological impacts especially with regards to aquatic organisms which would affect the mainstream Mekong River due to the intimate hydrological and ecological links, an international waterway. There could also be other direct impacts on water quality both from the deterioration of water quality in the reservoir and chemical run-off resulting from increased intensification of agriculture stimulated by irrigation. Hence, communities on both sides of the Mekong in both Thailand and Lao PDR would likely experience negative impacts from any such water infrastructure development and thus be classed as trans-boundary impacts. At the same time, the LSRB is vulnerable to any water infrastructure developments occurring upstream or downstream in the Mekong Basin which might negatively impact fish migrations, both on the mainstream Mekong and major tributaries such as the proposed Nam Theun 1 Project (Blake, 2008).
- In the past it has been tempting for some commentators from civil society and the media to present state and non-state actors in the Nam Songkhram Basin in a rather simplistic light. The state actors and institutions tended to be presented as the corrupt, aggressive developers ignoring environmental and local concerns (often in alliance with greedy private business interests), while the villagers were presented as the innocent victims of unchecked development which destroyed their natural resources-based livelihoods. The state actors and local actors were nearly always presented as homogenous entities, diametrically opposed in their prime interests. Reality of course if far more complex, and these simplistic representations do not allow for the diversity that exists amongst each group of actors at all scales from local to national and international. It would be equally wrong to paint a picture that struggles over water governance are only between local and higher level actors, as there are also everyday conflicts occurring over access and rights to water and natural resources at the community level and even occasionally household level which are rarely, if ever, recorded publically. Thus it is very difficult in a short report to capture the complexity and diversity present in the Basin, but it will have to suffice here to record that it exists.

Recommendations

- The Nam Songkhram Basin needs its own River Basin Committee, distinct and independent from the Mekong Area 2 RBC it currently resides under as six arbitrary sub-basins which cannot act or plan in a coordinated single vision for the Basin due to the present structure.
- The new single Nam Songkhram Basin RBC should be significantly different from the existing RBC's across Thailand, which have had a rather poor image to date. This probably implies disengaging itself from the present top-heavy WRD bureaucratic structures and processes, and finding a new more independent role and structure. Naturally, the RBC should strive for greater transparency, broader participation and subsidiarity than has hitherto been the case in other river basins.
- It is inadvisable that new large or medium size irrigation projects should be built, given the problems with existing systems and poor participation rates, but rather emphasis should be put on solving the

problems and increasing agricultural production through agro-ecological means and methods. Where irrigation systems have been abandoned or are hardly used, studies should be made into possibly retiring them and in some cases implementing dam removal and ecological restoration projects.

- Dominant institutions could benefit from examining the rationale for and recommended practices or processes used in Multi-Stakeholder Platforms (MSPs) or Dialogues, as a means to ensure more informed and inclusive interaction and knowledge exchange between key actors. While this approach may seem counter to their present hegemonic role in Basin water management, equally to continue the exclusive and top-down decision-making processes of the past, will inevitably lead to further conflict and ecological damage, undermining the socio-economic futures of all Basin inhabitants who depend on healthy ecosystems for their livelihood.

VIII Annexes

Annex 1 Annotated bibliography of main literature

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Annex 2 Timeline of Significant Basin Events

DATE	EVENT
1957	Introduction of nylon fishing nets to Songkhram Basin and start of modern "Era of commercialization"
1961	First five year National Economic and Social Development Plan commences
1965	Parallel to a process of concessionary logging, commercial charcoal production started, reaching a peak around 1975, and over by 1979
1975	Formation of Agricultural Land Reform Office (ALRO) with mission of land re-distribution to poor farmers
1978	Tawan Farm – first agribusiness venture in NS Basin established
1981	Lam Nam Oon large-scale storage dam and irrigation project completed
1983	NEDECO/TEAM report for Interim Committee for Investigations into Mekong Basin completed, recommending first irrigation mega-project for Songkhram
1984	Sun Tech Group Company Ltd arrives in basin, acquiring land and establishing intensive farming operations
1988	Sun Tech Ltd builds tomato processing plant and expands farming ops in Sri Songkhram District

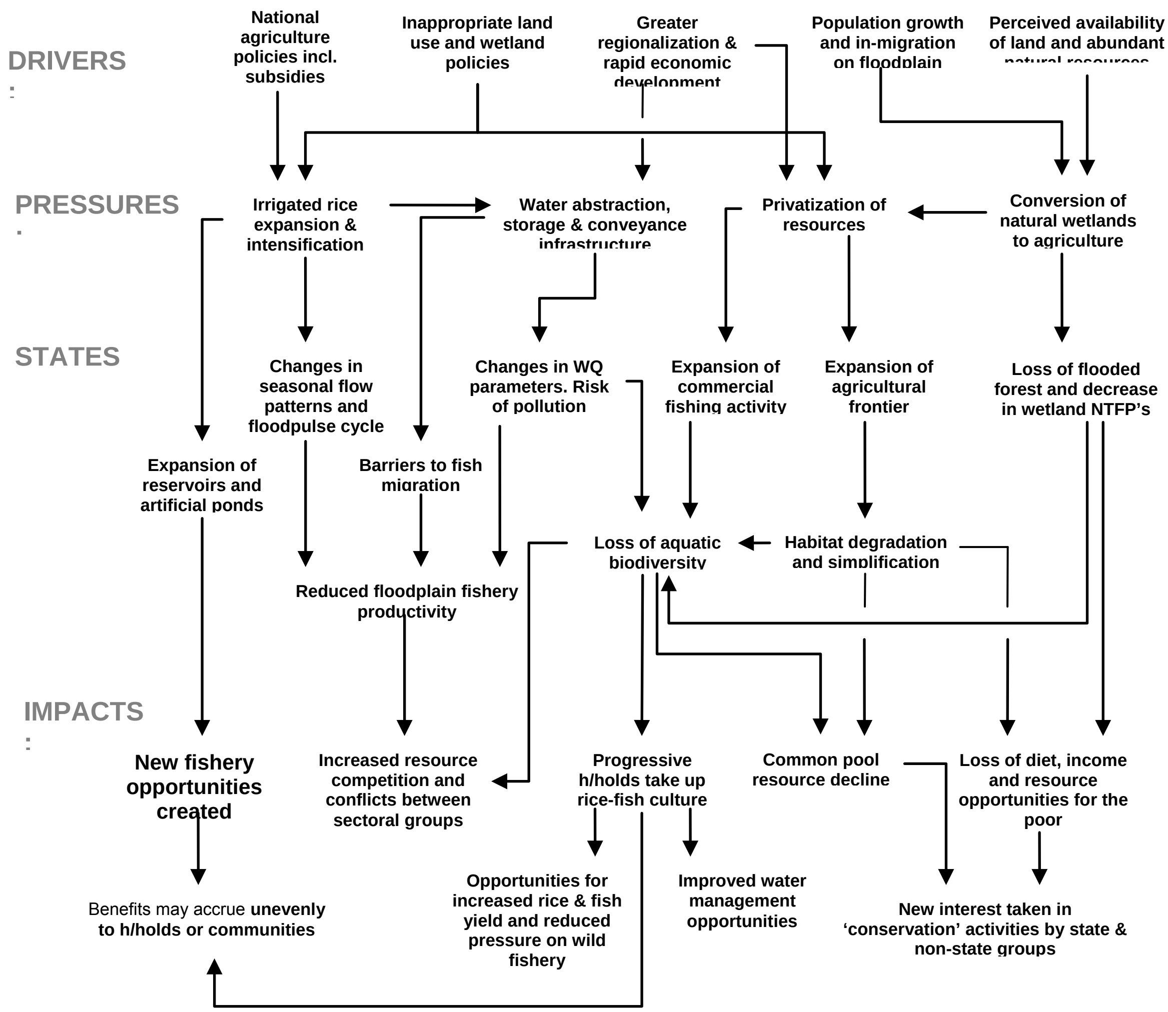
April 1989	Nam Songkhram Project approved by Cabinet for feasibility study and design to be prepared by DEDP
March 1990	DEDP hire Engineering Consultant Company Group, Asian Engineering Consultant Ltd (AEC), Pal Consultant Ltd (PALCON) and Sir William Halcrow and Partners Ltd (HALCROW) to design project and conduct EIA.
Jan 1994	Nam Songkhram Project's first EIA rejected by National Environment Board. New EIA/mitigation plan contract given to Khon Kaen University team.
1995	DEDP estimate Nam Songkhram Project will cost c. $400 million to complete
1996	• Asia Tech Pulp & Paper Ltd (sister company to Sun Tech) proposes building 150,000 tonne/year pulp mill in Songkhram Basin • Nam Songkhram Basin Conservation and Rehabilitation Club formed as local community-based network • Sept 96 a seminar on ways to reduce environmental impacts resulting from Nam Songkhram Project was held in Bangkok for various stakeholders
1997	• Asian economic crash – "tom yam gung" effect – causing postponement/cancellation of many projects • "People's Constitution" ratified giving local communities greater participation in decision-making and responsibility for natural resource management • Dec 97 Thai NGO Project for Ecological Recovery hold seminar in Bangkok for key stakeholders, incl. local community representatives, about the Nam Songkram Project
1998	Upper Songkhram Basin Development Project is implemented under Accelerated Rural Development Office oversight, building numerous dams, weirs and irrigation reservoirs.
1999	• Lower Songkhram Basin recognised by OEPP as a "wetland of international significance" • Revised Khon Kaen University EIA and EMP completed and sent to OEPP for review
October 2000	National Water Policy approved by Cabinet
2002	MoNRE and DWR formed during ministry reorganization. DEDP closed down and irrigation projects passed to RID.
March 2002	Nam Songkhram Project rejected by Thai cabinet as having high costs and insufficient benefits
Feb 2003	MWBP Demo Site project office in Sri Songkhram District opens
July 2004	Official start of MWBP Phase A project
Late 2004	Lowest mainstream dam / "weir" at Ban Nong Gaa between Udon Thani and Sakhon Nakhon Provinces completed by DWR, effectively

	blocking flows d/stream. No irrigation benefit achieved. Uncertain purpose. Similar dam built 30 kms upstream in previous year is rapidly abandoned.
2005	• PM Thaksin's "National Water Grid" plan proposed, aiming to irrigate 90 million rai nationwide, incl. inter-basin water transfer from Nam Ngum Basin, Lao PDR to Nam Songkhram Basin • Aug 05 Thaksin visits Sri Songkhram District during flooding and declares it a "national disaster", recommending a dam be built at the mouth of the river – Nam Songkhram Project returns
2006	ONEP suggests proposing LSRB as a potential Ramsar Site
Dec 2006	MWBP Phase A complete and project closed
June 2007	UNDP-TRAC project completed – IUCN involvement in LSRB ceases

Annex 3 DPSIR model linkages in LSRB wetlands-agriculture DPSIR model linkages in LSRB wetlands-agriculture

The Lower Nam Songkhram River Basin wetlands were selected as a case study for inclusion in the Guidelines on Agriculture, Wetlands and Water Resource Interactions (GAWI) project, coordinated by the Food and Agriculture Organisation of the United Nations (FAO), Ramsar Convention on Wetlands and Wageningen University and Research Centre (WUR) (Wood and van Halsema, 2008). The so-called drivers, pressures, state changes, impacts and responses (DPSIR) framework was applied to the LSRB wetlands case study, specifically considering rice paddy and fish culture/capture systems. The report concluded that using the DPSIR framework analysis there had been no integrated response in the LSRB to the challenges posed by intensifying agricultural development in sensitive wetlands habitats, resulting in profound impacts on ecosystems services and functions. It showed that there tend to be single agency responses to problems (both real and constructed), with little inter-agency coordination or integration, while the multiple benefit wetlands services important for local livelihoods, were mostly poorly recognized or seen in terms of agricultural benefits only, which encouraged conversion of the wetlands to monocrop plantations (both rice and industrial pulpwood trees). This expansion of the agricultural frontier led to impacts on capture fisheries, flooded forest food and medicinal products, livestock grazing and other common pool resource declines causing loss of diet, income and resource opportunities for local communities. The multiple linkages revealed by the DPSIR model are shown in the web of relations in the diagram below.

Some DPSI linkages found in floodplain wetlands – agriculture systems in the LSRB (Source: Wood and van Halsema, 2008)



Annex 4. Some key similarities and differences between Tai Baan Research and Intermediate E-Flows Assessment approaches

Main characteristics of research	**Tai Baan Research approach**	**Intermediate E-Flows approach**
Utilises locally situated knowledge	Y	Y/N (but recognizes LEK)
Utilises scientific knowledge	N	Mostly
Applies a basinwide approach	N	Y (with limitations)
Utilises bottom-up/participatory principles	Y	Y/N
Utilises an ecosystem/holistic approach	Y	Y
Engenders stakeholder ownership and acceptance	Y	Y/N
Makes extensive use of secondary data	N	Y
Is relatively fast to implement and can be completed within a narrow time frame	N	Y/N
Is adaptable and responsive to local changing local reality	Y/N	Y
Requires external “experts” during start-up phase and for guidance	Y	Y
Is readily transferable to other basins	Y	Y
High labour time input required	Y	N
Uses much technical jargon, not immediately accessible to outsiders	Y	Y
Involves wide spectrum of stakeholders in process	Y	Y
Uses peer-review at various stages of research process	Y	Y/N
Builds capacity as an integral part of research process	Y	Y
Is local action-oriented	Y	N
May be predictive to development scenarios	N	Y

ANNEX 5. The Department of Water Resources – Vision, Policy and Strategy

Vision of the Department of Water Resources

"The Department of Water Resources is the main agency that is determined to achieve excellence in managing water resources of the country in an integrated, efficient and sustainable way, by applying principles of good governance for the quality of life of the people."

Policy of the Department of Water Resources

Manage, conserve, rehabilitate, develop and solve problems of water resources efficiently, justly and sustainably, according to principles, by concentrating on participation of local administration organizations, community groups, networks, private organizations and all other groups in society, in order for a good quality of life for the people.

Strategy of DWR

1. To propose policies, plans, regulations and measures for managing water resources that are fully integrated, using a process that ensures participation of all stakeholders in the basin, in order to sustainably develop the country.

2. Manage, develop, conserve and rehabilitate water sources throughout the country, in order to meet the needs of the people, together with managing in order to use benefits sustainably and protecting, alleviating and solving water crises.

3. Promote and support the strengthening and ability to participate of people who are impactees, local organizations and networks in managing water, together with public relations, building knowledge, and spreading technology in order to ensure sustainable management of water resources.

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Improving water allocation through multi-stakeholder platforms in the Mae Kuang watershed, northern Thailand

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Improving water allocation through multi-stakeholder platforms in the Mae Kuang watershed, northern Thailand

Santita Ganjanapan, Louis Lebel

[1]Abstract

This paper analyses the establishment, activities and impacts of the Mae Kuang River Sub-basin (RSBO) and Upper Ping River Basin Organizations and how they have interacted with other pre-existing institutions and platforms in the Mae Kuang watershed. So far the Maek Kuang RSBO has not been an effective multi-stakeholder platform. Farmers note it has been largely irrelevant to their water allocation problems that are managed by muang fai and the Mae Kuang Dam organizations. Irrigation officials note that the RSBO works outside the Mae Kuang irrigated areas and so irrelevant to their core work. Water users in the Northern Industrial Estate in Lamphun obtain their water through other channels and address water quality issues in other venues. Despite limitations with stakeholder participation in, and resources for, river basin organizations, various other water user groups and networks continue to be active in addressing water management problems. Pre-existing institutions – in short – remain crucial to negotiation and conflict resolution processes. A watershed-oriented RSBO in Mae Kuang is still needed to help deal with complex water allocation and quality challenges among sectors and locations, but must be built in coordination with pre-existing and alternative platforms

Introduction

Water management in urbanizing regions is complex as it involves many actors with divergent and shifting interests and cultures. As water management is a social and political process, multi-stakeholder platforms (MSPs) are often promoted as a way to support deliberations that can inform negotiations and decisions. The potential of innovative forms of cooperation and consensus-building, however, need to be understood within specific socio-economic, political and ecological contexts.

In favourable circumstances multi-stakeholder platforms can help build mutual understanding, resolve disputes and become a prelude to more difficult negotiations or assessment of options (Warner 2006, Dore 2007). In unfavourable contexts such as those of high social inequity, disorganized stakeholder groups and low technical and financial capacities, multi-stakeholder platforms may have serious limitations (Faysse 2006).

Effective water governance depends on management of conflicts and securing meaningful participation of all stakeholders (Hirsch 2006; Both Ends, 2005). Local weaknesses as well as local strengths need to be considered. The study of successes and failures of novel multi-stakeholder platforms should be sensitive of history. As resource conflicts have been inherent in societies, ways of managing such conflicts have developed in many cultures and places. Diverse arenas where resource users share resource problems, exchange ideas and seek solutions are continually created and modified through time.

New multi-stakeholder platforms, thus, must do their work alongside pre-existing resource management arenas and institutions (Mollinga et al. 2007). This raises questions of institutional interplay (Young 2002): Do new platforms engage with or detach from pre-existing institutions? Do they enhance, compete, weaken or cause mixed consequences to previous institutions? How do stakeholders, especially disadvantaged ones, use multiple platforms to pursue their goals?

In many parts of the world integrated water resources management is being promoted through reforms that create river basin organizations (RBOs) (Biswas

[1] Working paper in preparation for submission to a journal (Water Alternatives or Water Resources Management). Please do not redistribute or cite without contacting the authors (llebel@loxinfo.co.th; santita.ganjanapan@gmail.com).

et al. 2005). In the Mekong Region, many water resource management experts have expressed hopes that river basin organizations could improve the allocation of water resources. A few believe that much will depend on what roles RBOS take upon themselves – in short – how they do their social work. One possibility is that they convene and support multi-stakeholder platforms.

Relevant experiences with similar structures are mixed ranging widely in scale, contexts and designs. At one end of the scale there are studies of pre-existing relatively small, relatively homogeneous, groups of water users. In the upland areas these are typically called watershed organizations or networks and are typically involved in management of land, forests and water resources. In rural lowlands, these watershed organizations or networks are more commonly known as water user groups or associations being engaged in allocation and management of water for irrigation purposes. From the latter we know that too much control by state agency leads to recurrent failures because they leave inadequate scope for local management decisions (Patcharee 1995, Patcharee Arthan 1995, Tan-kim-yong et al. 2005, Molle 2007). From the former we know that insecure *de facto* rights of access and use of water, forest and land act as a disincentive to more careful, long-term management (Wittayapak and Dearden 1999, Lebel et al. 2008).

At the other end are analyses of efforts to manage large international rivers, typically through river basin organizations and international agreements. These efforts in the Mekong Region emphasize allocations of flow among countries and trans-boundary impacts of large projects and so do not always capture widespread but highly localized use of water-related services (Jacobs 2002, Lebel et al. 2005, Molle et al. 2009).

At both very small and very large scales, therefore, the number of different stakeholders visible to processes of deliberation and negotiation are often modest. In between those scales, especially in urbanizing regions, the diversity of stakeholders is often much higher including both agricultural and non-agricultural water users. Due to proximity and mobility of water stakeholders in peri-urban areas, interaction among them remains plausible. The Bang Pakong Dialogue Initiative is one possibility where local stakeholders can share and find common problems and solutions (Dueňas, 2007; Pangare *et al.*, 2007; Prangthip, 2007).

Over the last five decades water and land uses in the Upper Ping watershed n the inter-montane valley around the cities of Chiang Mai and Lamphun have been transformed first by the expansion and intensification of commercial agriculture and then on-going urban-industrial growth and tourism (Lebel et al. 2009).

With urbanization, domestic, service and industrial demands for water have expanded.

Expectations for water allocation, protection from floods and pollution control also rise. Disputes and contests among very divergent interests increase. Municipalities, local governments in the peri-urban areas, and other decision-making bodies need to make some difficult decisions about the allocation of water as well as management of flood risks and control of pollution.

Diversification and intensification of lowland agriculture caused by green revolution technology resulted in multiple cropping systems, increased water demand and water shortage and water conflicts especially in the dry season. Intensification and diversification of agriculture in the highland areas are results of state policies to stabilize shifting agriculture, to suppress narcotics and to stop deforestation. Commercial crop production in the highlands as well as territorializing state policy of forest protection and evacuation of forest communities added to intense resource conflicts among highland communities, between highland communities and the state as well as between highland communities and lowland communities.

This paper analyses the establishment, activities and impacts of the Mae Kuang River Sub-basin (RSBO) and Upper Ping River Basin Organizations (RBO) and how they have interacted with other pre-existing institutions and platforms in the Mae Kuang watershed. The study is a follow-up and extension of David Thomas (2005, 2006a) who documented the early establishment of the Mae Kuang and several other RSBOs in the Upper Ping in detail. In it we argue that despite limitations with stakeholder participation in, and resources for, river basin organizations, various other water user groups and networks continue to be active in addressing water management problems. Pre-existing institutions – in short – remain crucial to negotiation and conflict resolution processes both inside and outside river basin organizations. A watershed-oriented RSBO in Mae Kuang is still needed to help deal with complex water allocation and quality challenges among sectors and locations, but must be built in coordination with pre-existing and alternative platforms.

Methods

Document review and in-depth interview

We used official documents, directories of watershed committee members, meeting reports as well as direct observation of several meetings held during research period. Our focus was on the establishment of alternative water management organizations including muang fai water user groups, the Mae Kuang River Sub-basin Working Group, the overlapping Ping River Basin Committee, the Mae Kuang Tara Dam Irrigation Water User Organization supported by the Royal Irrigation Department and the Village Volunteers Network for Protection of Mae Kuang Environment and Nature.

We made in-depth interviews with past and current members of watershed committee and working groups as well as others with knowledge and key responsibilities related to water management. So far we have collected interviews from following informants: farmers, village heads, muang fai irrigation committee members, representatives from Tambon Administrative Organizations, NGO workers, representatives from industries and services, Mae Kuang irrigation officials, members of Ping and Mae Kuang Watershed Organizations and representatives from the Secretariat Office of the Ping Watershed Committee. Topics included water problems, perceived responsibilities, challenges and possible solutions of Watershed Organizations, how the RSBO contributes to integrated river basin management and water conflict management, and how RSBO performances are relevant to stakeholders interests.

Sample of households in upper part of Mae Kuang sub-basin

A random sample was drawn from for eight contiguous sub-districts in Chiang Mai province in the peri-urban transition zone. Of 505 household numbers listed in our randomly drawn sample from government lists 66 were not current: in 38 cases there was no house with that number, and in another 24 cases a building was present but had no occupants, and 4 cases it was the second household of someone already in sample. Of the 439 potential households in the sample we were unable to complete questionnaires in 39 instances. In 15 cases we were unable to make appointments and meet the residents that neighbours told us were normally resident despite repeat visits, including in evening or on weekends. In 9 cases the reason was that household members we met were physically incapable of responding to questions because of deafness, mental disabilities, alcoholism, or serious illness. In 15 cases households refused cooperation. Complete information was therefore collected from 400 households.

Analysis

We analysed changing structures and operational orientation of river and sub-river basin committee and working groups using descriptive statistics.

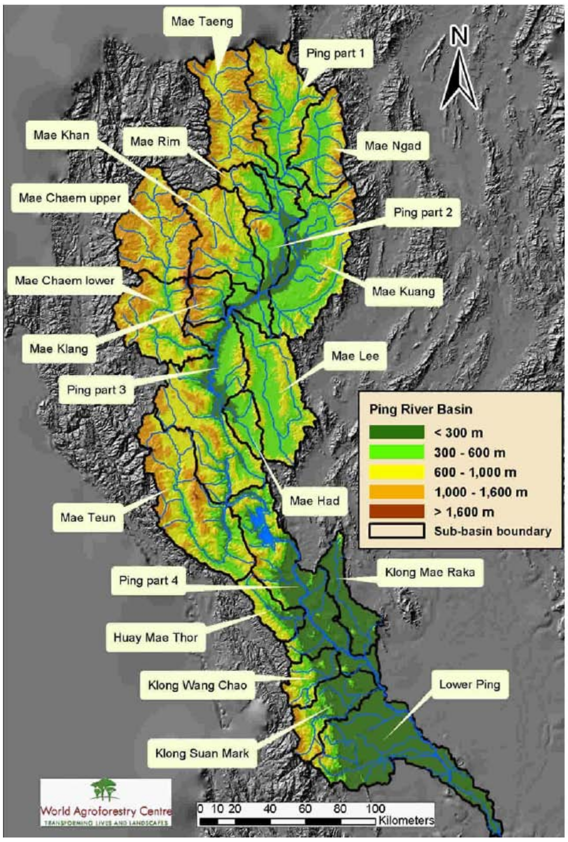
As multi-stakeholder platforms consist of actors holding different power and knowledge, we use political ecological approach to study river basin organizations as space of contestation and negotiation for access to water resources. Stakeholders use and integrate different knowledge to negotiate for access and control of water resources at different spaces and scales.

Issues

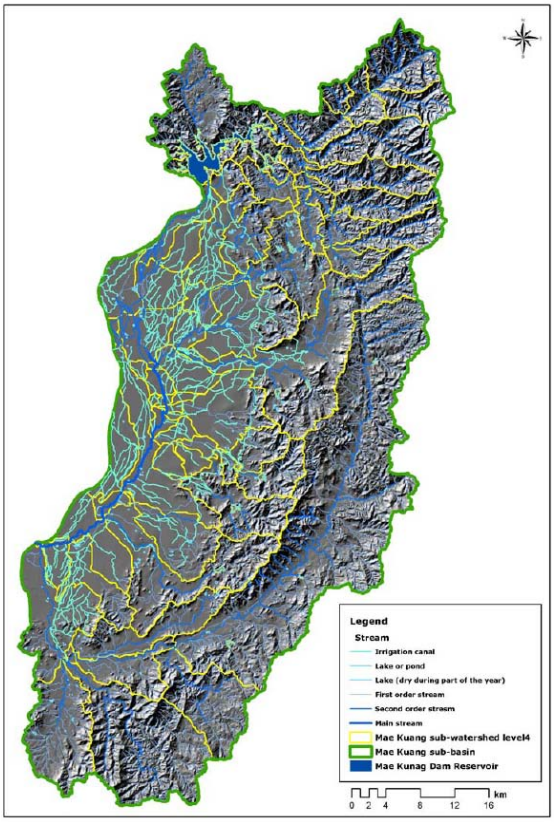
The Mae Kuang watershed is one of 15 officially recognized sub-basins of the Ping river basin. It covers 1661 km^2 (First Regional Office of Water Resources, 2007; Punya Consultant and Sigma Hydro, 2003) in four districts of Chiang Mai province and two districts of Lamphun province (Figure 1). Depending on source evergreen and deciduous forest covers 52-59% of the watershed, but is almost largely restricted to higher elevations (Thomas 2006a) (Piphat, Daranee and Saowanee, 2002; Panya Consultant and Sigma Hydro Consultant, 2003). About a third of land is devoted to agriculture and 7-8% to residential use. Mae Kuang has total population of 291,000 of which half are classified as rural.

Figure 1 Study area. (Source: Thomas 2005)

A. Topography and sub-basin boundaries in the Upper Ping river basin.



B. Mae Kuang river sub-basin showing water resources features.



Source: Dr. Methi Ekasingh, CMU Multiple Cropping Center

Water-use

Average rainfall in the Mae Kuang sub-basins is just over 1100mm (Thomas 2006a). Natural surface water yearly averages 564 million m^3, with 470 million m^3 in the rainy season, and 94 million m^3 in the dry season.

Several different estimates of total annual water demand have been made with slightly different assumptions. Thomas (2006a) estimated 577 million m^3 of which 546 are for irrigation, 21 for domestic, and 10 for industry. Another estimate suggests 489 million m^3 with 459 for irrigation, 16 for domestic and 10 for industry and tourism (Punya Consultant and Sigma Hydro Consultant, 2003). A third estimate suggested total 337 million m^3 of which 328 are for irrigation, 8 for domestic and 10 for industry (Piphat, Daranee and Saowanee, 2002).

The main point to draw from these estimates is that over 95% of water use is for agriculture and that use already succeeds storage. Total storage capacities of 68 state-developed projects are 337 million m^3 with Mae Kuang dam dominating with a capacity of 263 million m^3. Mae Kuang dam storage in practice, however, is usually well below capacity, thus in December 2009 near beginning of dry season water was only 30% of storage capacity, and on March 24, 2010 only 19.2% or 50.496 million m^3 (Mae Kuang Operation and Maintenance Project 2009a). Of the 57,200 hectares of farmland in the sub-basin 89 % is 'potentially' irrigated and the rest is rain-fed. Of the land irrigated approximately a quarter is in Muang fai systems and rest in state projects, most from Mae Kuang Dam (Mae Kuang Operation and Maintenance Project 2009a). Seasonality is a key issue with irrigated areas served by Mae Kuang Dam in dry season typically less than a quarter of those possible in wet season.

Groundwater use

Groundwater withdrawals are very important part of water management in the basin. Groundwater recharge averages 40 million m^3 per year with safe yield of 8 million m^3 per year. While most recharge of the Chiang Mai inter-montane basin is from surrounding hills the Mae Kuang river also appears to recharge groundwater (Asnachinda 1997).

Many private wells, typically 50m deep, were already in place of agriculture in the early 1980s (Margane and Tatong 1999). Models suggest that the highest rates of groundwater abstraction in the Upper Ping basin are around San Sai and San Kamphaeng, both in the Mae Kuang sub-basin (Margane and Tatong 1999).

One estimate made several years ago suggests withdrawals already were around 7.9 million m^3 per year which is close to the safe yield (Panya Consultant and Sigma Hydro Consultant, 2003). Many more wells have been dug in the last decade. One survey suggests that of the current 1,334 groundwater wells, 85% were drilled during the past ten years, and more than two-thirds to serve domestic demand. Only 10% of new wells were for agricultural uses, and of these 85% are in Muang district of Lamphun – the downstream area where water scarcity is most severe. Almost 70% of the new wells for industrial and services purposes were also in Muang district of Lamphun.

An important institutional change after the bureaucratic reforms of 2002 was the transferring of responsibilities of several former government agencies responsible to rural tap water provision to the Department of Groundwater Resources. Formerly 4 agencies were responsible for rural tap water provision: Department of Mineral Resources, Department of Public Works, Department of Health and Department of Rapid Rural Development. They drilled groundwater for rural communities. After bureaucratic reform (1 October 2002), all their works were combined and transferred to the new Department of Groundwater Resources. There are two rural tap water management patterns. First is management by tap water management committee. Water users must organize themselves into water user groups, select rural water supply committee, draw water use regulation and maintain the systems. Second, management by local administrative organizations: municipalities, tambon administrative organizations and provincial administrative organizations (Department of Groundwater Resources, 2006).

Water pollution

Water pollution of both surface and groundwater is a serious problem in Mae Kuang sub-basin. In the upper part of the sub-basin, there are problems with pesticide contamination (Suphang, Watts and Punya, 2007). In the lower reaches there are multiple pollution problems.

Surveys by the Pollution Control Department during 1997-2001 found surface water quality deteriorated as moved downstream from Sansai district to Mueang district of Lamphun (Panya Consultant and Sigma Hydro Consultant, 2003). Contamination due to phosphorus, nitrate-nitrogen and ammonia is higher than in other river sub-basins in the Ping watershed.

Pollution is caused by many sources including municipal and industrial effluents, as well as intensive cropland as well as pig and dairy farms. Other sources of pollution come from small-scale and cottage industries which produce traditional mulberry paper, food-processing and batik textile as well as other industries not covered by typical regulations applying to factories (Thomas 2006a: 92; Piphat, Daranee and Saowanee, 2002). Organic pollution results in very low dissolved oxygen all year round. In the dry season there are reports each year of dead fish floating in the river near industrial plants and dense urban land uses.

A study in 2007 by the First Regional Environment Office (Chiang Mai) in 2007 documented similar trends. Water in Doi Saket district of useable for domestic consumption with modest treatment and suitable for fishery, agriculture, and conservation of aquatic lives as is. Prior to reaching the Northern Industrial Estate, water quality had deteriorated and needs substantial treatment before it could be used for many purposes. Downstream from the estate water quality was only suitable for transportation.

There is a history of conflicts over water pollution among farmers, urban water users, industrial and service operators. High quantity of ammonia and nitrogen are caused by direct effluents from communities without treatment (First Regional Environment Office (Chiang Mai), 2007. Water quality indicators often exceed standards (Pollution Control Department, 2009). Greenpeace (2007) reported in 2007-2008 that groundwater was contaminated by such toxic chemicals as lead, copper and zinc in Nong Ped village near the Northern Industrial Estate in Lamphun province.

The Northern Industrial Estate was accused of causing pollution in the paste. Wastewater treatment facilities were subsequently constructed by NIE and operated by a private company. The NIE claimed that there are more industrial plants outside NIE which may or may not have adequate wastewater treatment facilities.

Allocation conflicts

Access to water depends substantially on position within the Mae Kuang watershed. Doi Saket and San Sai district in the upper reach receive relatively more water from the Mae Kuang dam, whereas the middle reach, in San Kamphaeng district and Mae On branch-district receives less water. The lower reach of the sub-river basin, in Ban Thi and Mueang districts of Lamphun province, receive the least water as they are at the tail of the main irrigation canals.

There is serious competition over water allocation at least twice a year at meetings at Mae Kuang dam focusing on what areas will receive how much water (in cubic meters) during what time (how many days with water and how many days without water). During dry season when Royal Irrigation Department dissuade farmers from growing rice, farmers at upper reach insist on growing wet rice, whereas farmers in the middle reach grow rice only when they can have water. Farmers in lower reach have to give up growing wet rice as there is not enough water.

Farmers and the Irrigation Department are both strategic in negotiations and subsequent patterns of water use. Farmers typically over-plant relative to agreement expecting to be able to use images of crops in the ground as a way to lever additional water at the end of the dry season when shortages are most acute (to prevent disastrous crop losses); the irrigation department, on the other hand, is conservative in its recommendations for land-uses, aware that it will often have to deal, in practice, with appeals for special assistance as the dry season unfolds.

Position within irrigation systems is also important at finer scales. In in-depth interviews noted that farm at tail end of system were often short of water and as a result lost crops and were in debt. Others pointed out, however, that some of the latest canal infrastructure associated with Mae Kuang dam reduced the accessibility of water compared to what they had before under the Muang Fai system because of height differences.

In the upper reach where household survey was carried out water shortages were most likely between March and May, peaking in April at 18%, and rare outside this period. Altogether about 22% of households reported some shortage in at least one month. Duration of longest shortages experienced was as follows: less than or equal to a week (7%), between a week and a month (10%), more than a month (4%). Shortages were primarily experienced by those needing water for rice (14%). Shortages were much less frequently experienced for other agricultural activities, like field crops (2%), orchards (3%), livestock (2%), or aquaculture (1%). Non-agricultural uses rarely experienced shortages (all < 1%). Households who have suffered shortages typically attribute them to low flows in the dry season (83%) and less frequently to consumption by others (23%) or changes to water delivery systems (33%).

The Mae Kuang Dam and associated irrigation reservoirs and infrastructure seem to have raised expectations about availability of water beyond what can actually be delivered. Downstream peri-urban, municipal and industrial areas experience more serious water stress and conflicts than in the upstream areas.

Officials at Mae Kuang dam, in some years, “*ask*” farmers to stop cultivating dry-season rice in order to save water for urban consumers (Techawongtham 2004). Agricultural water users in Mae Kuang Dam are upset that the Provincial Water Authority has higher priority in water than farmers as it buys water from the dam to produce urban tap water. They complain that the Provincial Water Authority and the Northern Industrial Estate, pumps away ‘their’ water for sale as tap water for urbanites and factories.

Tap water in the Northern Industrial Estate in Lamphun is drawn and treated from Mae Kuang river, and wastewater from industrial plants within the Estate is treated before releasing into the river. If drought occurs and water is not sufficient for production, the Northern Industrial Estate may ask directly from the Royal Irrigation Department to release additional water from the Mae Kuang Dam. According to three officials at NIE and two irrigation heads at Mae Kuang dams, to date, NIE has never asked for irrigation water from the dam, and dam personnels have never sent water to NIE. The Sahapattana Industrial Park in Lamphun province pumps groundwater for its factories to its reservoir that has a storage capacity of 0.5 million m^3. Many industrial plants outside the Northern Industrial Estate and Sahapattana Industrial Parks use groundwater for their production (Sahapattana Inter-Holding, 2009).

Perpetual water scarcity due to increasing and diversifying water demand prompts a number of industries, services, golf courses, housing estates, and villages to increasingly extract groundwater or dig ponds for their own uses. As urbanization continues, new residential areas opted for groundwater extraction for domestic consumption. In addition, idle farmland caused by land speculation prompted some industrial factories to negotiate for water from some local irrigation heads while other factories extract groundwater for their own production.

The biggest and most controversial solution to water deficit in the Mae Kuang sub-basin is inter-basin water transfer project proposed by the Royal Irrigation Department. The mega-project is expected to annually divert 147 million m^3 from Mae Taeng and Mae Ngad rivers, which are two tributaries of Ping river, through tunnels into the Mae Kuang reservoir. It is anticipated that irrigated farmland in dry season and for urban and industrial purposes could be roughly tripled. Public hearings for this controversial mega-project were done and construction budget prepared, but construction has not started as the environmental impact assessment report has not yet bee approved by the National Environment Board (Mae Kuang Operation and Maintenance Project, 2009). There are criticisms from some water users in Mae Taeng irrigation system that they have long experienced water shortage and disputes in their own system and that inter-basin transfer would exacerbate these problems.

Mae Kuang RSBO and Upper Ping RBO

Origins

Responding to promotion by Global Water Partnership, Asian Development Bank and World Bank for integrated water resource management, the Thai government established river basin committee for 25 major watersheds in the country and created pilot project on sub-basin participatory watershed management model in the Ping river in 1999 (Thomas 2006b).

The institutional reforms were, in a large part, a response to specific conditions placed on loans to the Agriculture sector by the Asian Development Bank (ADB) following the 1997-98 financial crisis (Lebel et al. 2009). This included guidelines and requirements for promotion of integrated water resources management concepts through to introduction of river basin committees or organizations, and the creation of so-called apex regulatory authorities under new water laws (Abonyi, 2005). Lobbying by farmers with concerns over water pricing has been an important factor in the institutional stalemate with a national Water Law that would give administrative, policy-making and regulatory teeth to RBOs and the Department of Water Resources.

In 2000, the National Water Resources Committee was established by Prime Minister Office Regulation. Participatory selection process of Ping Sub-river basin Committee consecutively by diverse groups of representatives from sub-district, district, provincial and basin levels. In 2003 the bureaucratic reforms established the Department of Water Resources, and new selection process of two set of Ping Upper and Lower Ping River Basin Sub-committees according to the same 2003 regulation. The project on participatory watershed management was led by the Office of Natural Resources and Environmental Policy and Planning in the Ministry of Natural Resources and Environment and financially supported by ASEM II Trust fund managed by World Bank.

Three sections of Ping river basin were studied and planned: upper ping section 1, Mae Kuang river sub-basin, and lower Ping section 5. The tasks were to develop a model for integrated water management that can be applied in other watersheds by establishing RSBOs, catchment action plans, and preparation of operation manuals, strengthening capacities of water-related stakeholders particularly local administrative organization and community organizations in watershed planning, implementation and monitoring processes, and reinforcing control and incentives in pollution abatement.

David Thomas (2005, 2006a) documented the selection and early establishment of the Mae Kuang River Sub-basin Organization (RSBO) in some details summarizing some of the difficulties and lessons learnt as well as training and planning activities carried out. Although the challenges were recognized there was substantial hope that a flexible and negotiated approach to design of river sub-basin organization's structure and functions would lead to much better planning and dispute resolution mechanisms in the peri-urban mix. At the outset it was been obvious that Mae Kuang RSBO needed better coordination but that getting the required cooperation would be a challenge. Several well established groups and coalitions of interests around key agencies had already articulated their visions. There were a lot of agendas on the table. Several multi-stakeholder platforms already existed, ranging from muang fai water user groups, to the Royal Irrigation Department supported Mae Kuang Dam Water Users Association.

Reorganization and representation

According to the 2003 Prime Minister Office Regulation, Mae Kuang Watershed Working Group is a part of a hierarchy of watershed committees (Table 1, Column 2). The National Water Resources Committee managed at the helm, followed by the Upper Ping and Lower Ping Watershed Sub-committees, the Mae Kuang Watershed Working Group, Provincial Watershed Working Group, District-leveled Watershed Working Group, and Sub-district-leveled Watershed Working Group. The reason why administrative-based groups coexist with hydrological-based groups is due to Thai bureaucratic structure and the nature of spatial units. Watershed boundaries and administrative boundaries do not overlap perfectly. Mae Kuang sub-basin, for example, encompasses parts of six districts of two provinces, while other districts fall into other river sub-basins. Integrated water management based on sub-basin boundary is theoretically convenient, but state budget is practically distributed and audited through hierarchy of line agencies and local administrative organizations. As local administrative organizations have become increasingly important in terms of budget allocation and natural resource management responsibilities within their jurisdictions, it is difficult to manage based on watershed unit alone. It is hoped that availability of both spatial and administrative bodies can facilitate coordination.

Table 1 **Multi-level water management organization**

Level	2004-2008	2009
National	**National Water Resources Committee**	**National Water Resources Committee**
Watershed	**Upper Ping River Basin Sub-Committee**	**Ping River Basin Committee**
	3 Academic Working Groups: Integrated Plans, Information, Public Relations and Participation	**Ping River Watershed Management and Academic Sub-Committee**
	Mae Kuang River Sub-basin Working Group	**Mae Kuang River Sub-basin Working Group**
Local	**Provincial River Basin Working Group**	**Provincial River Basin Working Group**
	District River Basin Working Group	**District River Basin Working Group**

	Sub-district River Basin Working Group	-

There is a fair bit of documentation about changes in structure and composition of the initial working group that set up the RSBO and then RSBO itself. Initial proposal for membership of RSBO were modified following discussions (Table 2).First a group of 45 was established. A later directive issued by DWR suggested new group should have only 36 members. There were to be 6 representatives of local organizations, 6 agricultural water users, 6 business/industrial water users, 6 representatives of people's organizations/environmental NGOs, 6 kamnan/headmen, 1 academics or knowledgeable person, and 5 government officials (2 DWR, 1 RID, 1 Groundwater Resources, 1 Protected Forest Officer from MONRE). In the end, no one filled in posts of academic, and there were only 2 representatives of business/industrial water uses from Lamphun, and 2 from people's organizations or environmental NGOs. Two persons concurrently held two positions within this RSBO as both agricultural water users and kamnan, and as agricultural water user and representative of a people's organization. A third person held posts in higher and lower level working group and the Ping RBO. A fourth was both an RSBO member and leader/founder of recently-established Lower Mae Kuang network from Ton Thong district, Lamphun.

Table 2. Final structure of the first Mae Kuang RSBO

Chairpersons and Secretaries **Elected Locally**	
Sub –Committes **Linkages with Local sub-watershed committees**	
Membership composition:	
Old existing community organizations	**6**
Community forestry networks	**3**
Stream conservation networks	**3**
Farmers networks	**3**
Ethnic minority groups	**3**
Housewives groups, Women's development groups	**3**
Local government (TAO, municipalities, PAO)	**6**
Kamnan/ Village headmen	**6**
Government officials, agency local units	**4**
Local specialists	**4**
Non-governmental organizations(NGOs)	**2**
Private investor / entrepreneur groups	**2**
Total membership	**45**

During 2007-2009 changes in governments caused multiple changes in RSBs and RSBOs committees with new rounds of selection (Table **1**).Previous committees at district and sub-district levels are excluded for the reason that provincial committee can coordinate already through administrative hierarchy. A new set of

Ping River Basin Committee was appointed in August 2008, a new set of Ping River Basin Management and Academics Sub-Committee was introduced in 2009, and appointment of Provincial River Basin and District River Basin Committees were completed in 2009.

After the August 2008 reshuffle the Mae Kuang RSBO was to have 36 members distributed widely across stakeholder groups (Table **3**). Representation of non central government stakeholders was substantially better than in organizations and committees at higher and lower spatial administrative levels. In terms of areas being represented, however, it is found that not all areas within the Sub-river basin are well represented. There was, for instance, no one applying to be selected as representatives from industrial and services water user group in Lumphun. Neither are there any representatives from academics and sub-district administrative organizations from downstream areas of Mae Kuang sub-river basin.

Mae Kuang River Sub-basin Committee and most of RSBOs in Ping river basin, however, are still in the process of selection in late 2009. New selection process was employed based on application for at least six applicants for each representatives of water users, and let applicants select representatives among themselves. Those who are selected become Ping River Basin Committee, and those who are not selected are appointed as members of the new Ping River Basin Management and Academics Sub-Committee. The same process is also used for selection of other river sub-basin, provincial and district watershed working groups. Size of the new Ping River Basin Committee reduced to 36 committee, but the sizes of watershed working groups vary according to the sizes and complexity of each sub-river basin.

As of March 2010, selection of the new Mae Kuang River Sub-basin Working Group was still on-going. Based on pattern of three other river sub-basin working groups which now have been appointed expect around half from government including 40% from line agencies and 10% from subdistrict administrative organizations. A further 10% are either village headmen and district khamnan. Agriculture was typically around 10%. This suggests a rather drastic shift away from wider representation and greater focus on central government agencies (Table **3**).

Table **3** Percentage of Stakeholders in Watershed Committees and Working Groups at end of 2008

Stakeholders	NWRC	Upper Ping RBSC	Provincial RBWG	Mae Kuang RSBWG	District RBWG	Sub-district RBWG
Government (Line Agencies)		**38**	**77**	**11**	**33-60**	**4.3-12**
TAO (Local GOvernment)		**5.4**	**4.6**	**17**	**3.5-4.0**	**4.3-12**
Kamnan/Headmen		**0**	**4.6**	**17**	**3.5-4.0**	**25-30**
Agriculture		**41**	**4.6**	**17**	**13-52**	**21-29**
BS/Industry		**5.4**	**4.6**	**17**	**3.5-4.0**	**0**
NGO		**5.4**	**4.6**	**17**	**0**	**0**

Academics		**5.4**	**4.6**	**2.9**	**3.5-4.0**	**1.4-4.2**
Community		**0**	**0**	**0**	**0**	**21-29**
Religion		**0**	**0**	**0**	**0**	**1.4-4.2**
Total Members		**37**	**22**	**35**	**15-27**	**24-69**

During 2004-2008 the Upper Ping Watershed Working Groups each with 24-27 members on Integrative Planning, Information and Public Relations and Participation were each dominated by Government stakeholders (67-85%). Typically there were only two, and sometimes one or no, representative from agriculture, industry, civil society and 'resource persons'. In the more recent Ping River Watershed Management and Academic Sub-committee with 47 members just under half are from government (Table **3**). Government representation in the Upper Ping River Basin Sub-Committee has increased with the changes in organization after 2008 (Table 4). At the same time representation of farmers was slashed.

Table 4 Stakeholder Composition of the old Upper Ping River Basin Sub-Committee and the current Ping River Basin Committee (as of early 2010).

Stakeholder	2004-8 Upper Ping River Basin Sub-Committee	Since 2009 Ping River Basin Committee
Government (Line agencies)	**14**	**19**
TAO (Local Government)	**2**	**3**
Agriculture	**15**	**5**
Industry & Service	**2**	**5**
NGOs	**2**	**0**
Resource Persons	**2**	**4**
	37	**36**

The key point is that throughout the establishment period of the hierarchy of watershed management structures there has been a lot of attention to representation on committees with efforts made to come up with a system that can fit in with existing administrative hierarchies. This included some individuals belonging to multiple committees and thus providing mechanisms to link them.

Mandate, responsibilities and resources

The major tasks of Ping River basin Committee and the working groups as perceived by the committees and members are to produce integrated water management plans, and to strengthen capacity of network groups. Such network groups vary from *muang fai* irrigation groups to watershed conservation groups, housewives groups, youth groups, and other groups by disseminate knowledge and information as well as budget and materials for activities such as watershed conservation, ceremonies to pay homage and offerings to watershed spirits, tree ordination, prolongation of river life ceremonies, reforestation and construction of check dams in watershed areas to retain moisture in watersheds. Most of such activities, however, are done more in Chiang Mai province than in Lamphun province. Activities in Lamphun province are mainly digging and cleaning irrigation canals and restoration of water quality. The committees tasks are to consider whether plans and measures can solve water-related problems, to what extent plans and measures can be integrated, whether there are redundancies and conflicts among plans and measures.

RSBOs (Sub-River Basin Working Groups) collect information regarding 1) water and other natural resources; 2) water infrastructure that are already completed; water demand (in order to propose plans & projects on water resource management within sub-river basins to the Provincial Watershed Working Group and the Ping River Basin Committee); 4) coordinate state agencies' operation plans regarding water resource management, development and conservation of water bodies, water allocation, water resources rehabilitation, flood prevention and control, drought, water quality in order to prepare catchment-scale operation plans; 5) public dissemination of information on water resources and RSBO to people within catchment in order that they learn and have correct understanding; 6) compromise and conflict resolution regarding water resources within sub-river basins; 7) follow up and evaluate performance of government agencies regarding water resources within catchment and report to RBO committee and sub-committees; 8) Any work assigned by RBO committee and sub-committees.

Responsibilities of Provincial Watershed Working Group are similar to Sub-River Basin Working Group except that they deal within the whole province whereas Sub-River Basin Working Groups deal within their own sub-river basins.

Responsibilities of Ping River Basin Committee (RBO) are: 1) submit recommendations to National Water Resources Committee about policies, plans, projects, ways to solve problems in water resource management including performance of government agencies, local administrative organizations and private sectors within river basin; 2) prepare plans on water resource management within river basin; 3) coordinate in preparation of operation plans and budgets of government agencies and local administrative organizations so that they correspond with water resource management plans within river basin; 4) prioritize activities, determine water quantities to be used by each activity and determine water allocation measures suitable to available water based on equity and efficiency; 5) follow up and evaluate performance of government agencies within river basin; 6) encourage local administrative organizations in management of small water bodies for benefits and equity; 7) acquire information and facts on water resources in order to prepare statistics, information, comments, recommendations regarding basin management; 8) compromise and conflict resolution regarding water resources within river basin; 9) coordinate operation on water resource management with other RBOs; 10) disseminate information to the public, get comments and make the public understand water resource management; 11) appoint sub-committees and working groups to work on assignments by the RBO; 12) work that are assigned by the National Water Resources Committee.

Planning activities

The focus on data collection and planning; very little is done to directly address water allocation conflicts. Operationally water allocation within Mae Kuang sub-river basin is done by the RID. The RBO and RSBO do not have formal authority to allocate water or manage conflicts. They do not have the legal power to enforce such plans; line agencies may and may choose not to follow their. This situation would change if the draft water law was promulgated.

Planning is a largely an aggregation exercise with little effort to consider complementarities or contradictions. Criteria for setting priorities for projects are established and used to prepare submissions to committees and Bureau of Budget at higher levels. Plans and projects that do not receive any budget must be revised at local level, and resubmitted for consideration in following fiscal years. Moreover at the provincial and lower levels governors, district heads, and sub-district heads shoulder many responsibilities, and cannot be expected to always keep a watershed perspective in mind. In practice the ideals of integrated water resources management are hard to pursue.

Integrated water resources management plans are typically for 5-10 years with shorter plans prioritized higher. The annual planning process lasts approximately 10 months from July to March, from villages in July to Cabinet in April before going to parliament. There are currently two basic pathways to a plan (Figure 2). In the first pathway, plans and projects are prepared by line agencies and submitted to National Water Resources Committee before going to the Bureau of Budget at the end of March. These do not have to pass through a prioritization process. The second pathway is for villages to propose plans and projects. Sub-district working groups consider their appropriateness, and district working groups prioritize plans and projects according to criteria. Then, provincial/RSBO working group will consider and prioritize again before going to management and academic sub-committee to consider and prioritize, before going to ministries/departments for budgeting. From here, the pathway separates, one to other line agencies before reaching Bureau of Budget. Another to DWR, NWRC, and continue to Bureau of Budget as well.

River basin or sub-basin plans proposed by government agencies to solve water problems at sub-basin, basin, or beyond sub-district levels, can include physical infrastructure and non-structural measures. Plans are divided into six categories: water development, flood mitigation, drought mitigation, water management, water resources conservation and restoration, and water pollution abatement. Further subdivisions are used for budgeting.

Plans proposed by local communities though TAO should solve problems at village level or in specific areas. These action plans are collected from suggestions and needs of people during first round of local meetings, and are reviewed again in the second round of local meetings. Most of the local plans are for solving domestic and agricultural water deficit and improving water use efficiency.

Analysis of budget allocation gives some indication of the role and influence of stakeholders within the sub-basin. The 2010 yearly budget allocation for state plans within the Mae Kuang sub-river basin was allocated as follows: RID (89%); Department of Groundwater Resources (4.8%), Department of Water Resources (3.8%), Provincial Water Authority (1.5%), Department of National Parks, Wildlife and Vegetation (0.5%), and Department of Land Development (0.4%). Out of this budget allocation, most went to infrastructure development and improvement, that is, for flood prevention (55%), reservoirs (14%), canals (12%), weirs (9%), groundwater drilling (4.8%), pipelines (2.7%), water pumping (2.5%) and check dams (0.3%), and reforestation (0.11%).

This can be compared with 2010 budget allocated for the whole Ping watershed: RID (79%); Department of Public Works and Urban Planning (11%), Department of Groundwater Resources (3.7%), Department of Water Resources (2.4%), Department of National Parks, Wildlife and Vegetation (1.5%), Department of Prevention and Rehabilitation of Public Disasters (0.4%), and Department of Land Development (0.3%).

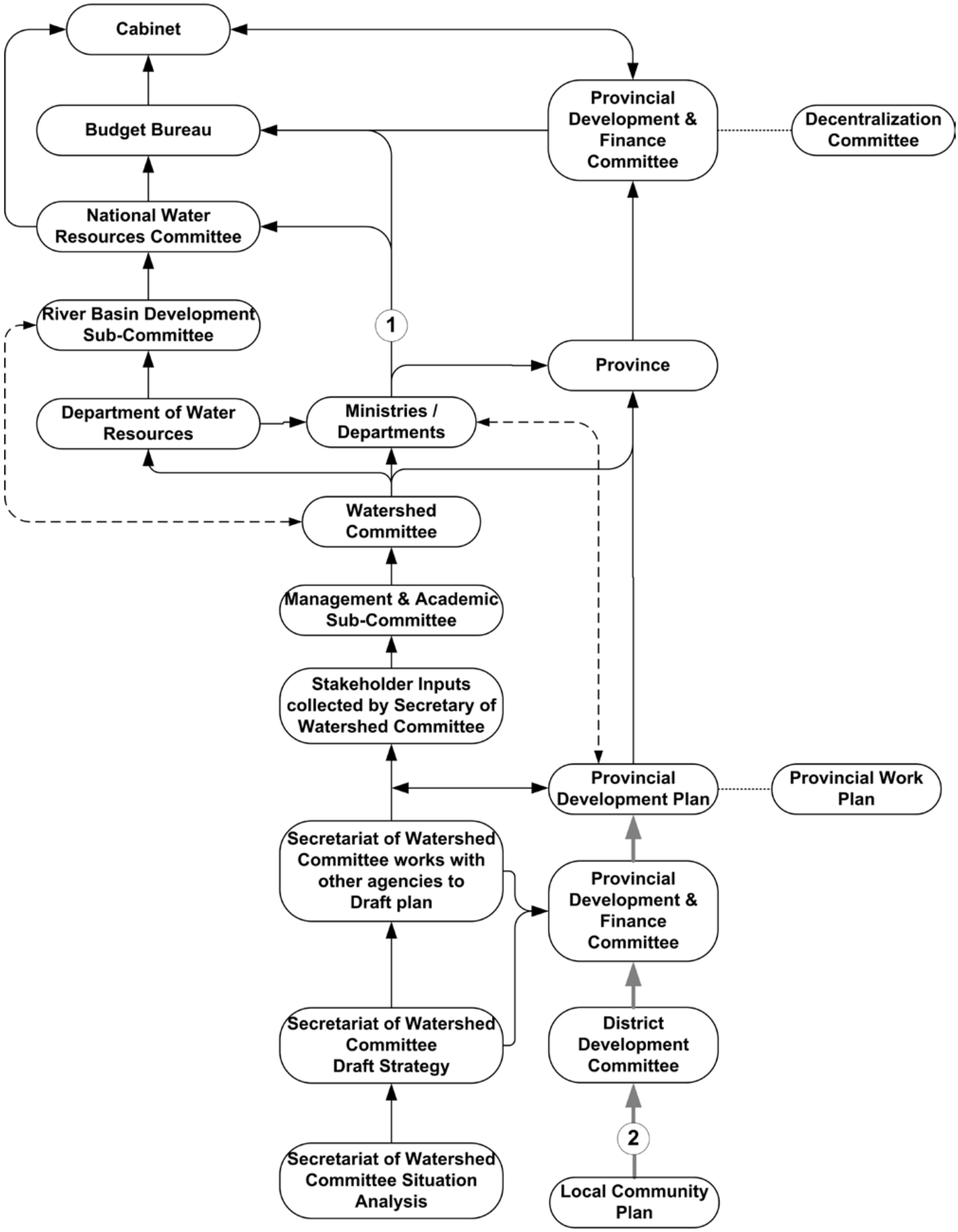
The second type of integrated plan (Figure 2) based on local inputs for the whole Ping river basin is more diverse in terms of recipient government agencies: Department of Groundwater Resources (52%), Department of Water Resources (35%), Department of Pollution Control (3.1%), Royal Forest Department (3.0%), Department of Factories (1.8%), Department of National Parks, Wildlife and Vegetation (1.8%), Royal Irrigation Department (1.5%), Department of Land Development (1%), , and Department of Environmental Quality Promotion (0.5%). The total budget for Ping watershed in 2010 was 4090 million Baht.

During meetings observed of the Upper Ping Working Group on Integrated Watershed Plans in 2004, representatives from local groups in Chiang Mai negotiated the prioritization of plans and projects. It was agreed to give opportunities to local representatives at sub-district and district levels to prioritize plans and projects rather than letting higher-level committees prioritize them. They reasoned that local communities are closer to water problems and directly receive both costs and benefits from the projects. Nevertheless there are complaints by local water user groups that they participated in making plans and budgets necessary for solving water problems at local level, but their bottom-up plans are often changed at higher scales.

An NGO representative interviewed thought that that the RBO/RSBO was a good idea but ineffective because it lacked resources. There was no local branch office for Mae Kuang Working Group, so meetings had to be done in hotels. But with little budget for travel, or low allowances for members, the incentive to work were not there. Budgets for operations of the organizations have fallen and as a consequence they cannot run their own meetings as frequently as they would wish and consultation exercises with wider public have to be curtailed. The organizations are encouraged to run their meetings in parallel with events held at provincial or district levels.

In Mae Kuang sub-watershed, there were neither proposed and approved projects on improvement of water quality and pollution control nor prevention of soil erosion and improvement of land use (Table **5**). Most projects were construction of water sources and distribution systems for agricultural use, domestic use, and flood prevention e.g. weirs, reservoirs, canal construction & improvement, village tap water, groundwater provision for village, dykes and drainage ways. Smaller number of projects focused on improvement, maintenance and restoration of natural and pre-existing water bodies and headwater areas as well as personnel development. Consequently, water problems and conflicts cannot be solved immediately if they are not already included in integrated plans and budgets.

Figure 2. Integrated water resources management planning process. Two planning pathways are highlighted (1 and 2). (Redrawn by authors).



To reiterate, in the bottom-up pathway the planning process starts at declaring water-related needs at village level and the tambon water working group collects and draft plans (Figure 2). District, Provincial and Mae Kuang River Sub-basin Working Groups then relate them to watershed and provincial strategies. Another planning sub-committee then considers and screens them so that they fit national government, provincial and watershed strategies and urgent needs. The secretariat then analyzes and screens projects using a system of prioritizing criteria. After this the Ping RBO will consider and forward proposals to DWR, National Water Resources Committee, Bureau of Budget, Cabinet, and eventually Parliament (Figure 2).

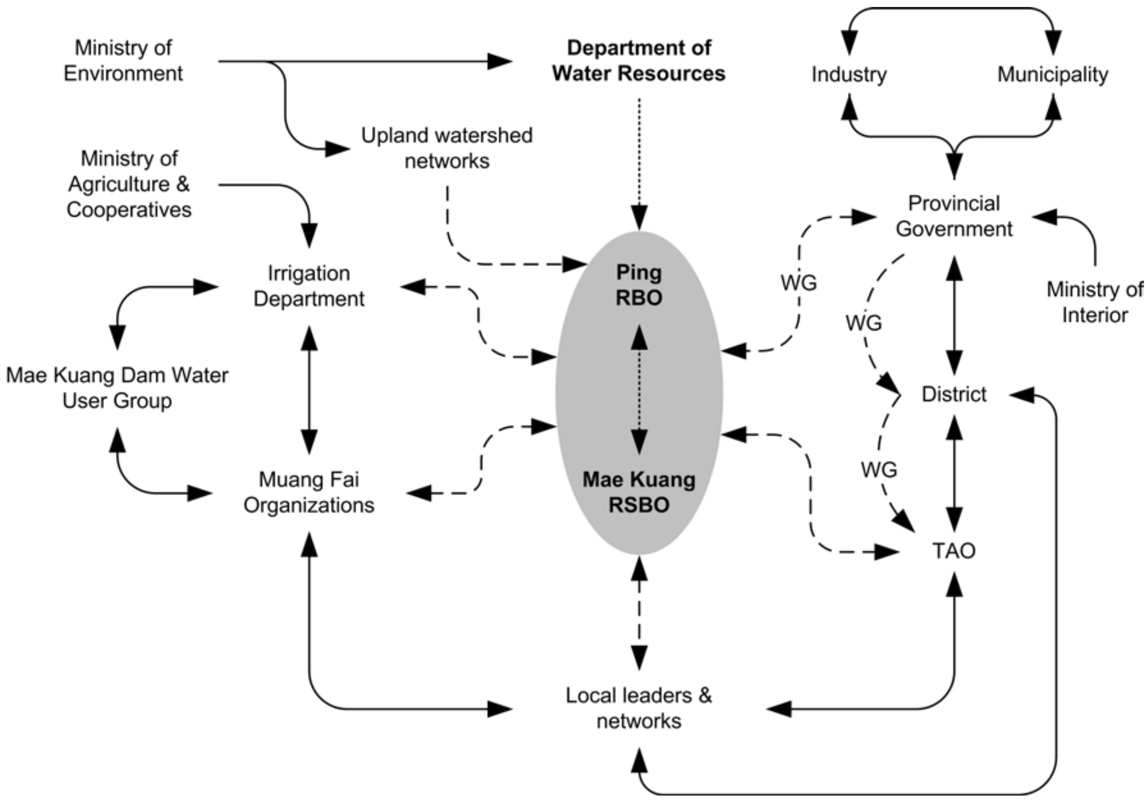
Table 5. Percentage of Budget Allocation for Different Activities in Mae Kuang Sub-watershed in 2007 as Proposed by District-Level River Basin Working Group and Prioritized by the Office of Upper Ping River Basin Sub-committee

Parts of Watershed	Land use	Districts and Totals	Management Activities	Provision and Development	Enhancing Water Use Efficiency
Upper reach	**urban, intensive agriculture, institutional**	**Doi Saket, Chiang Mai**	**0.17**	**10.79**	**5.68**
		San Sai, Chiang Mai	**0.30**	**18.72**	**4.59**
Middle reach	**urban, intensive agriculture, small-scale industries and tourism**	**San Kamphaeng, Chiang Mai**	**0**	**9.53**	**5.12**
		Mae On, Chiang Mai	**0.09**	**6.71**	**3.33**
Lower reach	**urban, farmland, export-oriented industrial estates**	**Mueang, Lamphun**	**0**	**14.70**	**8.87**
		Ban Thi, Lamphun	**0**	**7.15**	**4.24**
Totals			**0.56**	**67.6**	**31.83**

Pre-existing institutions and alternative platforms

The Mae Kuang RSBO and Upper Ping RBO were introduced into a context with a history of conflicts over allocation of water (see Section 3) and uncoordinated activities by various agencies and community-based organizations. Pre-existing institutions and alternative platforms were already in place leading to a set of potential interactions (Figure 3). The interactions which took place or did not, but probably should have, will be analyzed in this section.

Figure 3 The complex institutional context of the Mae Kuang RSBO. New organizations are in bold with fine-dotted lines indicating formal relationships. Solid lines indicate pre-existing institutions and relationships and dashed lines some of the important new relationships that had to be developed, but were not always successful. Not all possible links are shown. WG=working groups.



Muang fai irrigation organizations

Muang fai irrigation organizations consist primarily of farmers who use common irrigation water. Farmers within these organizations are diverse ranging from paddy farmers to vegetable, flower and orchard farmers, and from landowners, tenants, absentee farmers/orchardists/landowners. Although they cannot be called true multi-stakeholder platforms, *muang fai* organizations accumulate experiences in effective water allocation and conflict management through centuries of watershed management history, and have shown potential and flexibility in dealing with new challenges (Potter, 1976; Abha 1979; Vanpen 1986; Vanpen et al. 1980; Vanpen and Leuchai 1982; Tanabe 1981, 1994; Uraivan 1983).

Vanpen (1986) pointed out that *muang fai* organizations, or people's irrigation organizations, were more effective than state irrigation organizations. Uraivan (1983) and (Tanabe 1981, 1994) indicated that these organizations practiced some form of participatory democracy at the grassroots level. They were granted customary use rights of facilities and water rights in exchange for responsibilities in operation and maintenance according to communal rules and regulations. Members elected irrigation head along with committee based on technical skills and leadership ability. Not every member had a right to vote, though. As *muang fai* organizations prioritized rice production, only rice landowners have rights to vote on the basis of one man one vote. Other members who were orchard owners or tenant farmers did not have any rights to vote. In practice, this classification of members was not mutually exclusive as a rice landowner can also own an orchard. Anyway, the application of which rights depended upon specific situations. Members of *muang fai* organization could be at the village level or beyond village level (sub-basin level) which included several villages or sub-districts (tambons). Members were varied in terms of crop types and land uses. In the past, all members were peasants, and water demand was mainly related to agriculture.

The allocation of water was based on allocation of water rights to members. Members had rights to draw water according to their contribution in the operation and maintenance of the system. Water conflicts erupted within village and between villages. Traditionally, conflicts, arising from water overdraw or water thefts, within the village could be managed using traditional mechanisms. For example, irrigation leader serve as mediator to warn or to collect fines from violators. Inter-village conflicts, caused by water diversion at tail-end farmland, were also successfully managed by similar mechanisms.

Muang fai systems are changing. In the past Muang Fai leaders solved water allocation and conflicts based on their (moral) authority. Negotiation started from levels of leaders. If it was not successful, negotiation would go down to levels of assistants and eventually water users. As urban and industrial water users increase in number and in their water demand, new water conflicts erupt among farmers and non-farm water users. Traditional rules, leadership and processes of *muang fai* organizations become too constrained to effectively cope with complexity of conflicts (Tanet, 1994). Nowadays, negotiation with non-farm water users can be easy or difficult. If non-farm water users are not related to administrative leaders (like kamnans or village headmen), negotiation can be easy. If they are related to local administrative leaders, negotiation can be compromised. At present, muang fai communities view that negotiation is more important than water allocation as the latter is long developed and settled now. Current situations of diverse stakeholders require greater ability to negotiate, so muang fai leaders have changed from disappearing charismatic leaders to administrative leaders like kamnan, headmen, or persons working for influential figures. A number of muang fai leaders – some, if not all, who are representatives of agricultural water users – have become members of Mae Kuang RSBO. Moral leaders are less important. It is anticipated that new type of muang fai leaders are more capable to manage conflicts.

With the introduction of modern agricultural technology and increasing intensification and diversification of agriculture, multiple cropping became prevalent. As a result, water shortage was more pronounced especially in the dry season and at the tail-end portion of irrigated farmland. Water demand and water allocation became complex because of diverse cash crops with spatially and temporally different water requirements. New lowland cropping patterns are complicated with different crops being transplanted, tended and harvested at the same time (Anan 1984). (Sopon 1989) found that *muang fai* organizations adjusted in three ways. Firstly, by sharing of new source of water supply such as diverting groundwater to needy fields in exchange for some water fee exemption. Secondly, redistribute water in the dry season on a rotational basis, and shortening the rotational cycle to lessen problems of water thefts. Thirdly, negotiation to release water to downstream users in other villages, once effective in the past, fails under the new context of intense competition for irrigation water. Intervention from district government offices is increasingly sought in order to get fair share of water to drought-prone areas.

The rapidly-expanding Chiang Mai and Lamphun cities induces agricultural land conversion turning full-time farming into part-time farming, and productive farmland to idle land. Migration of young ex-farmers to seek non-farm jobs in cities and industrial estates causes labour shortage in agricultural production and irrigation system maintenance. Farmers cope with labour problems by turning to rain-fed agriculture, converting labour-intensive paddy fields into less labour-demanding *longan* fruit orchards, diversifying crops to cater urban markets, growing high-yielding varieties to avoid yield reduction, and also diversifying income sources to include non-farm activities. Women become more involved in irrigation works, which used to be male domain, as male labour move to work in town (Sopon, 1993). Moreover, agricultural water scarcity due to competition for water by urban and industrial demand coupled with small land holding caused farmers to rely increasingly on non-farm employment (Pearson, 1996, 1999; Cohen and Pearson, 1998)

Muang fai organizations consequently have to downsize and adapt by developing new strategies. As parts of irrigated areas are converted, they are excluded from water services. Some *muang fai* organizations, thus, sell water surplus in wet season to non-farm water users. In dry season, however, many opt to extract groundwater to irrigate dry season crops (Sopon, 1993). Within the context of agrarian restructuring, urbanization and industrialization, *muang fai* organizations find it difficult to sustain by themselves under changing technological and environmental limitations. They have to mobilize financial and technical resources from government agencies for system rehabilitation and maintenance, and seek legal status to obtain identity and rights to development funds and programs. They restructured their organizations by reducing irrigation assistants and including semi-government village head in the management committee. The reason was to facilitate resource mobilization from government agencies. Some of them create new links with capital rather than with state. This indicated increased hybridization of interests and strategies. The trend is towards greater state control over allocation of water and the bureaucratic incorporation of *muang fai* organizations (Pearson, 1996, 1999).

In a few cases changes have gone in the other direction in the Mae Kuang watershed. Another response to failures to address water allocation problems is to bring back older institutions and technologies. Due to inadequate irrigation from Mae Kuang dam and alternate water schedule which may not match crop needs, a number of farmers have found supplementary water by restoring abandoned muang fai systems.

In the past, there were minimal linkages between *muang fai* organizations with state agencies through village and sub-district heads who served as semi-governments officials (de Young, 1958; Wijeyewardene, 1965, 1973; Abha and Nisa, 1974; Tanabe, 1994). Despite the fact that *muang fai* organizations could manage conflicts due to their abilities to mobilize labour and resources, they increasingly seek assistance from government agencies for several reasons. Firstly, linkages with local government offices provide legal basis for tapping state financial and technical resources for system rehabilitation and maintenance. Secondly, conflict management experiences are constrained due to overlapping cropping schedule causing both intra-community and inter-community conflicts. For intra-community conflicts, social relations, informal sanctions, and increased fines are still effective. Nevertheless, mechanisms to manage inter-community conflicts, such as upstream diversion of water at the expense of downstream users, became limited as problems were beyond *muang fai* capacity. Thus, semi-government officials such as village headmen, provincial governors, or local and national politicians, instead of negotiation among irrigation leaders, are increasingly asked to mediate. Sopon suggested further that basin-wide intersystem coordination, represented by existing *muang fai* organizations, was necessary to resolve inter-community disputes.

Alternative watershed networks

At local community level, Thomas (p. 242) observed that diverse conservation activities had been going on for several years with suggestion and support from government agencies. Such activities had also been performed or newly initiated by local groups as problem solving strategies. The number of such activities was increasing and using watershed organizations as platforms. This was supported by academic institutions, private sector, government agencies and international organizations.

Management of the headwaters of the Upper Ping watershed are now under the responsibility of National Parks, Wildlife and Plant Conservation Department. The Department launched a participatory action planning to include forests, watershed and other environmental problems such as garbage and agricultural chemical pollution. Most of the projects were short-term including reforestation, vetiver grass cultivation, small weirs, information systems that integrate both scientific and local knowledge, and development of sub-basin environmental volunteer networks.

Since 2004 the First Regional Office of Environment has supported more than 20 local groups for activities including include tree ordination ceremonies, river life prolongation ceremonies, check dam construction, repair and digging of irrigation canals, tree planting, improvement of landscape around reservoirs, and training on water resource management.

The Office has supported only one local group in the Mae Kuang watershed. Beginning in 2006 it supported the Huay Kaew Reservoir Conservation Group in Mae Faek subdistrict, San Sai district with a tree ordination ceremony in watershed forests. The 76-membered group receives a small sum of budget from the Office of Ping River Basin Committee.

It was observed that the Office of Ping River Basin Committee (which reports to Department of Water Resources, MONRE) also gave technical advice and small financial support to local networks for these rituals as well as reforestation activities. However, there is only one network in Mae Kuang watershed linked to the Office. By contrast, the First Regional Office of Environment of MONRE works with several grassroots networks.

Local water user groups within Mae Kuang sub-river basin do not limit themselves to interacting with Ping RBO or Mae Kuang RSBO. They started networking and negotiating parallel to RBO/RSBO. One group started in 2006 in the lower reach of Mae Kuang basin. Village Volunteers for Natural Resources and Environment in Lamphun province, were informed about water pollution in Mae Kuang river by the First Regional Office of Environment, Ministry of Natural Resources and Environment (MONRE) that regularly monitors water quality through 7 river water monitoring stations. They involved different stakeholders (government agencies, NGOs, mass media, religious organizations and civil society), and initiate a project on pollution abatement and control through forum on "*Huam Haeng Huam Jai Kuen Nam Sai Heu Nam Kuang"* (Join Force and Mind to Return Clear Water to Kuang River). Believing that solution must start at grassroots level with local knowledge, they have Ton Thong Tambon Administrative Organization as their *chao phap* (convenor/facilitator).

Another related activity is to raise awareness of changing water quality and form new alliances through the project of *Dhammachatyatra* (or Nature Walk). This was done in 2007 by mobilizing three major existing institutions in Thailand: village, temple, and school, (or *ban, wat, rongrian*). A number of schoolboys and men were ordained as novices and monks with supports from villagers. Then, monks, novices, schoolchildren, teachers, villagers and some government officials walked to different major temples along Mae Kuang river observing and discussing about pollution, water flows and changing environmental quality. The walk started downstream from riverside temples in Mueang district of Lamphun province upstream to riverside temples in Saraphi, Sankamphaeng, San Sai and eventually Doi Saket districts in Chiang Mai province. This was done during April, June, July, August and September 2007.

In February 2009, another forum under the same name was organized, and another *Dhammachatyatra* was done in March 2009 starting from the upstream temple in Doi Saket district and ending at the downstream temple in Mueang district of Lamphun. Added to this were *buad pa* (tree ordination) ceremony at a headwater village in Mae On branch-district, and *sueb chata mae nam* (river life prolongation) ritual for Mae Kuang and Mae Lao rivers in Doi Saket district. Local knowledge and rituals played important roles in raising awareness and restorinag watershed forests and river ecology. This was done with participation from government officials and some private companies and industrial estate. Nevertheless, Ping RBO, Mae Kuang RSBO and First Regional Office of Water Resources do neither involve in these activities nor coordinate with First Regional Office of Environment. In fact, it was observed that Ping RBO, Mae Kuang RSBO deal very little with water pollution problems. Institutional domain and sectorial responsibility are clear.

Another group which coordinates with the Lamphun group is in the upper part of Mae Kuang. They are Mae Kuang Watershed Forest Conservation Committee. Their work encompass 6 tambons or 55 villages. Six tambons are Thep Sadet, Pa Miang, Huay Kaew which are responsible for forest protection, and Cheung Doi, Luang Nua and Mae Pong which are based mainly on agriculture. The upper watershed group has been active since 2001 with elected chairperson. Members work with neither salaries nor budgets. Without any budget from state line agencies, they tried to raise small funds by organizing *pha pa* religious ceremony. They, however, receive small sum of money from some tambon administrative organizations and some private companies. They hold monthly meetings in Huay Hong Krai Development Study Centre in Doi Saket district. Members include three representatives from each tambon (18 members), and 5 representatives from each village. Also present in meetings are government officials and local administrative organizations. Their work include forest protection and restoration through fire control, tree ordination, river life prolongation.

This networking can be a sign of development towards some form of multi-stakeholder platform outside RSBO. Some consider merging the two groups into one Mae Kuang network. However, this network does neither include industrial and service stakeholders nor coordinate with Watershed Committee. Issue of institutional domain and sectorial responsibility. (Participants in the forum consisted of local administrative organizations whose jurisdiction are adjacent to Mae Kuang river, First Regional Office of Environment based in Chiang Mai, Provincial Natural Resources and Environment Officials from Lamphun, Chiang Mai and Chiang Rai, Haripunchai Research Institute, Religious Organizations, mass media, village headmen and community leaders, Doctor Sem Pringpuangkaew Foundation, civil society and other government officials.

In order to negotiate for some external support, local stakeholders in the headwater of Mae Kuang sub-basin combined their local knowledge with newly-acquired knowledge about paying for environmental service. The headman claimed that villagers worked hard to safeguard and restore headwater forests and increase clean and steady water flows to Mae Kuang river. Thus, they should get some financial (or technical) support for doing such service. One headman disclosed,

> *"...The reason why there is water scarcity in Mae Kuang river is that there are too many people, too many water users. When lowlanders face water problems, they come to the dam, but they do not visit (its) headwater. Some local people (there) are disheartened. They do not have any incentive to protect forests. Lowlanders do not bring money to help highlanders. Highlanders have to buy rice. They collect non-timber forest products, work as agricultural wage laborers, and (use earnings) to buy rice for their own consumption. People in the whole Thep Sadet sub-district have to buy rice for their consumption...The Ping River Basin Committee does not give any*

> *support to us...Mae Kuang network is very small. We raise funds through pha pa ceremony which barely pays for our work. The state does not help us..."*

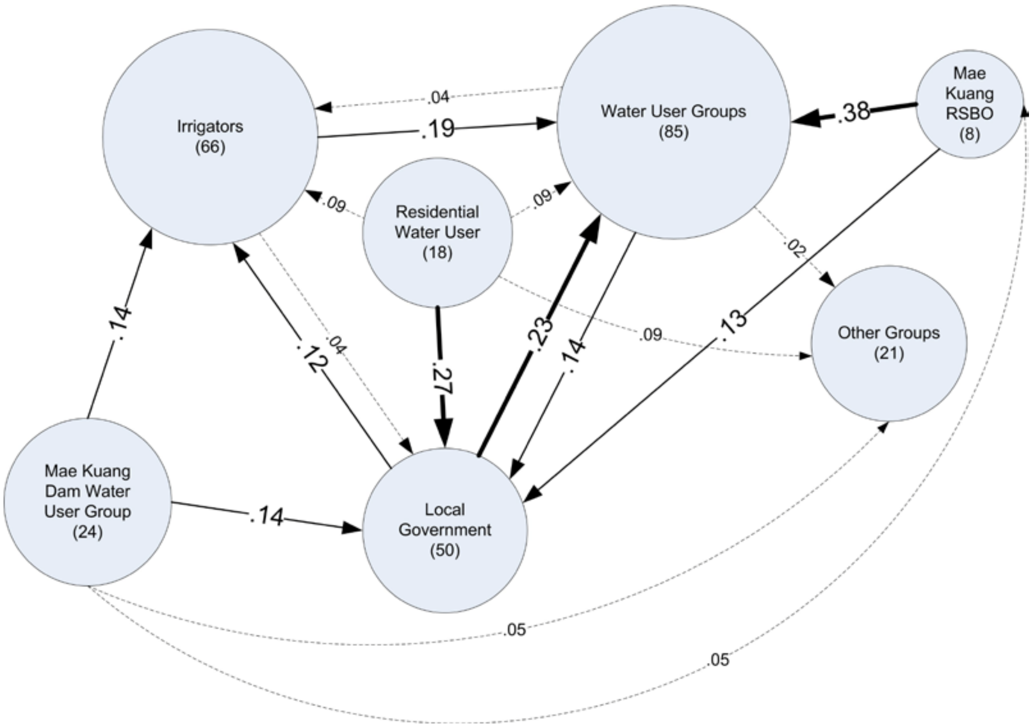
Coordination and competition

Different agencies have their own plans for the sub-basin. Negotiating shared or compromise vision has been tough. First plans therefore focus on organizational and procedures more than objectives (Thomas 2006a). The presence of several strong groups made it harder to agree on common approaches during establishment phase (Thomas 2006a). A common perception at the start was that the separate coalitions or factions do not work together very well.

From our surveys of households in the upper parts of the Mae Kuang basin we know a bit more about public perceptions of the various platforms and networks. Overall a third (32%) of households (in the upper reach of Mae Kuang) belonged to a water user group. Two-thirds (68%) said they usually attended water user group meetings. Men were more likely to belong water user groups and hold committee positions than women. Of households belonging to a water user group about three-quarters said their households paid a water user fee (76%) and had water use rights (78%). But the overlap between paying fees and having rights was imperfect: 84% who paid fees had rights, whereas 18% who did not pay still had rights. Overall about a fifth (21%) of respondents said they knew a member of the Mae Kuang River Sub-basin Committee. Of these about two-thirds (62%) had been involved in some of the Committees activities. A similar fraction (24%) of respondents knew members of the Mae Kuang Dam Water User Group and of these 60% had been involved in some of the Water User Group's Activities.

In our surveys in 2009 we also asked households about their alignments with different factions or groups. For just under half of households water was simply not an issue for which they saw themselves belonging to a particular stakeholder group. For those who did we asked them which groups (including the one they belong to if relevant) they felt were allies when it came to water management issues. The results are summarized in Figure 4 confirming the multiplicity of existing platforms and networks for water management.

Figure 1 Stakeholder's perceptions of their allies in dealing with water management issues. Circles are groups to which households consider themselves to belong or are represented in. Arrows are proportion of all links with allies a group has that are with a particular stakeholder group. Not shown are links to own group which ranged from 44-81%. Other rare groups included: rainfed-farmers, aquaculturalists, RID, RFD, Royal Project, Political Parties, NGOs, Village Headman.



One reason RSBO remains ineffective, according to a committee member we interviewed, is persistent bureaucratic competition. At the national level this starts between Ministries with river basins arena of rivalry (Molle 2007). The Department of Water Resources and Royal Irrigation Department are the key counterparts. The relatively new Department of Water Resources tries to establish itself and develop new working mechanisms through water law and watershed committees (Figure 3). State agencies including Royal Irrigation Department may either follow this pathway or directly submit plans and budgets to Bureau of Budget and eventually to the cabinet.

A retired RSBO committee member (who is also wet-rice farmer) criticized the RSBO as ineffective in solving water scarcity problem in the Mae Kuang sub-basin (specifically Mae Taeng Mae Ngad Mae Kuang interbasin water transfer project) claiming that the RBO/RSBO has neither power nor resources, and very slow to take action. The RID initiated the project but needs to gain public acceptance by organizing several public hearings during 2008-2009 (some RBO/RSBO committee members attended the public hearings, but they were not convenors). Some local leaders support the project by organizing meetings in 33 sub-districts in Chiang Mai and Lamphun in order to get water users' signatures (which they called referendums when, in fact, it may be more like petition) to be submitted to the government. (This act of seeking water users referendum was frown upon by some Ping RBO & RSBO members claiming that it is not normal process for project development. The process should start from common visions, planning and development of projects which occur annually. Plans and projects must correspond to provincial development strategies. The referendum was later discouraged).

At more local levels there are also inter-provincial issues within the Ministry of Interior: when the Upper Ping RBO is chaired by the Chiang Mai Governor, the Lamphun governor is reluctant to join as a “deputy”. Within the Ministry of Environment there are coordination problems among related agencies (Department of Water Resources, National Parks, Wildlife and Plant Conservation Department, Department of Environmental Quality Promotion and Office of Natural Resources and Environmental Policy and Planning).

One RBO Academic Sub-committee noted that when water users are faced with water-related problems, they usually ask for help from formal local leaders and district officials. They neither contact RBO nor RSBO because procedures along this channel are time-consuming, and RBO & RSBO will eventually coordinate with line agencies that have direct responsibilities. For instance water users in six sub-districts in irrigation area of Mae Kuang dam were successful in having water delivered to their dry areas by shifting from Mae Kuang water to more abundant Mae Faek-Mae Ngad river through negotiations directly with line agencies.

Engagement with the public

Engagement with the public can be through formal representation or through deliberation in public events. In some ways the RBO/RSBO became more open to local participation. Local representatives, for instance, are given chances to become members of higher-level committees. For example, some representatives at sub-district level in Mae Kuang sub-basin became also members of watershed committee at district, sub-river basin and even Ping river basin. Recently, one local water user representative from lower Ping section is appointed as a member in the National Water Resources Committee. In addition, committee chairpersons are usually government officials such as provincial governors, district heads, or head of local administrative organizations. Recently, a local representative from civil society from Kamphaengphet province is chosen to become deputy chairperson of the Ping Watershed Management and Academics Sub-committee.

In events convened by both the Department of Water Resources and Royal Irrigation Department participation is often construed as providing information or at best consultation rather than two-way interactions implied by meaningful participation (e.g. Rowe & Fewer 2000). For example, during meetings at district offices to enhance capacity to integrated water resource management and preparation of integrated water resources plans at district and sub-district levels, audience were informed about concept of integrated water resources management, how to prioritize plans and projects according to pre-determined criteria, stages in preparation of annual integrated water resources budget plans, village-level forms to be filled in about projects in terms of water problems, nature of projects, benefits to how many households, and whether public hearings are done. Village headmen will prepare such plans and projects with approval from villagers in public hearings. Then, the plans/projects will be submitted to sub-district working groups, district working groups and Office of Ping River Basin Committee respectively to be prioritized according to different sets of criteria.

A representative questioned nature of stakeholder participation saying that,

> “…*Government agencies do not understand participation… They want photographs and process of giving ideas. But do higher-level organizations agree with those ideas? Do they simply want to create (participatory) process to justify their search for budget, or to justify plan/project approval? We cannot probe whether the process is transparent or not. (Local) ideas that are collected may be rejected later…Local plans/projects proposed by TAOs, municipalities or muang fai irrigation groups are often*

not approved. We do not know which projects are approved since there are numerous projects being considered each year… "

Other organizations gained support from local groups. There were local views that participation was made only with supporting agencies. Many thought that their views were not represented in the sub-basin plans. They thus felt dominated by the agencies, and that some important policies are ignored.

Participation is also gender skewed (see also: Resurreccion et al. 2004). Despite women being involved in water use and management, participation of women within Mae Kuang sub-river basin is minimal and is at lowest (sub-district) level and not higher (district, provincial and sub-basin levels). Exception is that at river basin level, there are a few educated women participating, e.g. in Ping Watershed Management and Academics Sub-Committee.

Compared with local leaders and agricultural water user groups who regularly participate in meetings, representatives from industrial and service water user groups participate less in meetings. Though private entrepreneurs are represented in Ping RBP and Mae Kuang RSBO, they admitted that they seldom joined meetings. Some even acknowledged that they did not know that they are representatives in RBO and RSBO, and were never invited to join the meetings. Some know that they are representatives but admit that they are too busy to attend meetings. The opportunity cost of participation is high and the gain from participation is trivial. Some do not see benefits of participation as they can have access to other water sources such as groundwater or have their own storage of water.

Discussion

Is the Mae Kuang river sub-basin an effective multi-stakeholder platform? Most stakeholders we interviewed did not think so. Farmers felt they were irrelevant to water allocation problems compared to alternative platforms available such as those supported by muang fai and the Mae Kuang Dam organizations. Irrigation officials view the RSBO as irrelevant to water allocation because it works outside the Mae Kuang irrigated areas and see their own work as having been, largely, successful at dealing with allocation challenges.

The Ping RBO and RSBOs consider themselves working at policy and plan formulation level. They do not manage water conflicts in the Ping and Mae Kuang watersheds. There are controversial water projects and problems in this area: 1) Mae Taeng-Mae Ngad-Mae Kuang water transfer; 2) construction of Ping watergates to replace three hundreds-year-old weirs on Ping river which is adjacent to Mae Kuang sub-basin; 3) water competition between farmer and Provincial Water Authority within the Mae Kuang sub-basin; and 4) water pollution in the lower Mae Kuang sub-basin near industrial estates. While the RBO and related RSBOs in cases# 1and 2 were often put in the meeting agenda, and members of Ping RBO and Mae Kuang RSBO participate in the related public meetings, they neither organized or convened such meetings of stakeholders nor manage these conflicts themselves.

One outstanding exception in which the Ping RBO directly dealt with is water conflicts in Mae Sa sub-watershed where organic and inorganic water pollution was produced by the Elephant camp, resorts, and commercial farmers. The Ping RBO and Mae Sa RSBO organized meetings to manage such conflicts in 2006. As for Mae Kuang sub-watershed where there are many complicated water conflicts, no conflict management has been done yet. In fact, decision to manage this conflict was made from national level, and not at local or basin level.

Traditional channels of administrative and political power like village headmen and kamnan along with newer TAOs, however, are usually more important to solving local water problems than the RSBO. Working with, or enabling effective actions by, local elected governments and appointed administrators is essential.

The roles of Mae Kuang RSBO and Ping RBO are limited to integrated planning and coordinating projects with minimal political clout enabled by the Order of the Office of Prime Minister which is considered a lesser law. The Watershed Committees have not made their own integrated water resource management plans yet, but they coordinated other agencies' plans and projects. Each fiscal year, the RBO and RSBOs consider plans and projects from water-related government agencies and local administrative organizations in order to integrate all of them. Due to limited time, limited personnel and voluminous tasks, all plans and projects are put together with limited only limited consideration of redundancies and not much more integration.

So far most RSBO decisions seem to be about process and scope, rather than allocation itself. Even basic vision is still in dispute. This in contrast to other platforms in area which are longer established and have much better defined agendas and decision-making sets.

Several important limitations constrain the effectiveness of the Ping RBO and Mae Kuang RSBO.

First, water resource management by RBO/RSBO still face the problems of stakeholders lacking a watershed perspective. Although some plans, projects and budget allocation are prepared on watershed basis, many are also be proposed via local and supra-local administrative organizations. Budget allocation, critically, is still based on conventional jurisdictions. Coordination among government agencies are difficult. When Ping RBO and Mae Kuang RSBO consider plans, projects and budgets, all stakeholders including government agencies have to be present. This can be difficult.

Second, RBO and RSBO have also been plagued with budgetary problems and long delays in appointments of committees. Political instabilities since the last military coup in October 2006 have been one factor. Political crises are main obstacles to operation of RBO/RSBO as they are appointed by Order of the Office of Prime Ministers. Thailand has seen several prime ministers already, and have to recruit and appoint new sets of RBOs and RSBOs.

Third, despite RBO/RSBO being involved in plans, projects and budget preparation, conflict management still rely on local administrative organizations (TAOs) and district officials rather than RBO/RSBO. They would like greater authority that would be granted to them if the Water Bill was passed. It is not clear, however, whether this would actually enhance their role as conveners of multi-stakeholder platforms, or, instead lead to even more entrenched bureaucratic turf wars and alienation from agricultural water users.

Despite these many outstanding limitations and constraints the RSBO and RBO may still have important virtual or indirect functions. Because people are listed as being members they are invited to many meetings even-though the RSBO itself may be inactive.

The Ping MBO is learning to networking with local organizations. It tries to link with around 100 diverse groups including *Muang Fai* organizations, forest conservation groups, youth groups, housewives groups and so on. The most cited are two *Muang Fai* organizations in Chom Thong district, one Mae Wang forest and water conservation network, one Wiang Nong Long Water Development for Life Group in Lamphun, and one Mae Sa Watershed Restoration Group in Mae Rim district, Chiang Mai. All of them are outside Mae Kuang river sub-basin, and four of them are further away from urban Chiang Mai. The nature of such networking is that the Ping MBO gives small financial, technical and material support to projects that are initiated by those groups.

In terms of social acceptability, the RBO/RSBO has improved over the years and become more acceptable by government agencies, as one representative reflected,

> *"The structures of RBO/RSBO are good, but implementation is not acceptable among government agencies. But things improve during the past 2-3 years.... There must be some changes in operational regulations..."*

On the other hand the shift in membership since 2008-9 towards much higher representation of government in the Mae Kuang RSBO along with similar shifts in other parts of multi-level hierarchy would seem to imply less opportunities for public participation and deliberation and thus even less chance that it can be effective as a multi-stakeholder platform. The wider public may withdraw what little support it has given.

Conflicts over use, allocation and quality of water in the Mae Kuang watershed persist. The diversification of livelihoods and land-uses in some ways limits what many pre-existing platforms and institutions with a more narrow sectoral or geographic focus could achieve. A platform that can facilitate discussions across sectors and places would still be helpful for integrated planning and management of water and could, if done well, reduce conflicts and support negotiations. Some alternatives to the Ping RBO and Mae Kuang RSBO exist.

Muang fai irrigation groups in the peri-urban interface linger and still have potential to manage water resources and manage conflicts, but they need support from government agencies. *Muang Fai* organizations have effectively allocated irrigation water for a long time, but in many places have grown weaker due to lack of labor and money, environmental changes and activities of state agencies. The Ping RBO and related RSBOs have learnt this lesson, and are reaching out to create networks with them. Their networks, however, are still limited in number, and do not include active networks in Mae Kuang sub-basin that have developed parallel to RBO/RSBO. Those networks are working with other government agencies.Many *Muang Fai* organizations persist, and some are transforming themselves in directions akin to multi-stakeholder platforms.

Among many government and non-government actors in the Mae Kuang sub-watershed, the key actor is Department of Irrigation which dictates water allocation from Mae Kuang, Mae Ngad dams, Mae Taeng weir as well as small reservoirs. Members of these watershed committees, sub-committees and working teams represent different groups of stakeholders. While almost half of them are representative from water-related government agencies, representatives from local organizations were selected using bottom-up approach.

For the medium-term it seems highly unlikely that they a comprehensive platform will emerge from these basin organizations to address the diverse water allocation problems in the Mae Kuang watershed. The Ping RBO and Mae Kuang RSBO, if they are to contribute to integrated water resource management, need to pay much more attention to and learn how to work with pre-existing platforms and institutions which themselves are also changing.

Likewise watershed networks that have played constructive roles in reducing conflicts and improving land and water management in other locations could be strengthened within Mae Kuang watershed with help from the RSBO.

Different actors have different perspectives on what are the most important water allocation and management issues in Mae Kuang watershed. The RSBO has a niche, but it is a challenging one: helping other stakeholders develop a broader watershed perspective that looks beyond their immediate interests. A pragmatic perspective suggests this will involve a combination of social learning and more hard-nosed political bargaining among government agencies, places and sectoral interests.

Conclusions

Several platforms co-exist in the Mae Kuang River watershed with varying scopes and engagement by different stakeholder group. The Department of Water Resources' efforts to introduce an RSBO appears to have met with little success for a variety of reasons, including bureaucratic competition, lack of resources, and a failure to adequately take into account pre-existing platforms and institutions. Powerful local coalitions continue to support and work through alternative platforms and channels; but problems with cross-sectoral allocation and coordination persist.

To be effective as a multi-stakeholder platform for dealing with water allocation and related development challenges the Mae Kuang River Sub-basin Organization should re-start from existing capacities and organizations and grow outwards from these to deal with complexities of competing and complimentary water uses in the peri-urban tension zone around Chiang Mai and Lamphun cities.

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Livelihood and environment trade-off in *Doi Moi*: Industrial water use and wastewater management in a craft village in peri-urban Hanoi

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Introduction

Vietnam's economic reforms that started in 1986 have changed the whole make-up of the country and have been called 'one of the greatest success stories in economic development' by the Asian Development Bank in 2003. Rapid growth has occurred in both industrial and agricultural sectors, which contribute more than half of the country's gross national product NEA/WB/DANIDA, 2002). Since then, living standards have improved gradually, both in urban and rural lowlands. A 1999 report on poverty prepared by the World Bank (WB, 1999) indicated that the number of people living under the poverty line declined from 58% in 1993 to 27% in 1998 due to rapid economic growth and government policies. By 2002, the poverty rate reported by the United Nations Development Program was about 12%.

While the country's economic reforms have undoubtedly resulted in a major expansion of industrial and agricultural outputs and in an overall reduction of poverty rate, these have posed serious problems and challenges on the state of environment. Several scholars have pointed out that the country's strategy has implied a drive towards optimal utilization of the country's natural and human resources for fast-track economic growth and the subordination of long-term environmental concerns. But ironically, unlike other countries in Southeast Asia, Vietnam entered this period of catch-up industrialization and modernization with a large catalogue of unresolved environmental problems. It is thus forced to play a delicate balance between economic growth and environmental concerns (Di Gregorio, Rambo & Yangisawa, 2003; Sinh, 2004; O' Rourke, 2004). In this context, economic growth too often becomes the overriding priority to the exclusion of environmental considerations despite principles that have already been set in official discourses (Kelly, Lien, Hien, Ninh, & Adger, 2001)

One of the hallmarks of Vietnam's ongoing economic reforms has been private sector development and its enhanced integration with the global economy. It is in this sector that tension between fast track and rapid economic development on one hand, and the environmental concerns on the other hand is being intensely played out. This chapter examines this tension through a primary research of industrial water use and wastewater management in a craft village of Vietnam. The private production case examined in this study is a most pervasive mode of privatized industrial production in Vietnam – the household-based artisanal production – that is linked to domestic and international markets. There are presently 1439 craft villages in Vietnam, of which 70% are located in the North of the country. The majority of craft villages (up to 80%) are household-based artisanal production. Craft villages create employment for 11 million people, which account for 30% of the labor force in the rural and semi-rural areas. Products of these craft villages contribute an amount of 600 million USD/year to the national economy through exports. The particular craft production (i.e. metal manufacturing) too, which is the subject of this paper, is not only a popular form of livelihood in peri-urban and rural areas. Incidentally – and paradoxically – it performs an important environmental function of recycling while itself creating new and heavy local environmental and health burdens.

The structure of this chapter is organized as follows. Section 1 discusses the issues of privatization and environment in the current reforms in Vietnam. Section 2 provides an overview of the study site and a discussion of history of development of Van Mon commune. Section 3 describes metal recycling process, water use and water pollution in the village. Section 4 presents a profile of villagers' craft livelihood and its impact on the environment and health. The concluding section analyzes the key issues in the tension between livelihood and environment, governance problems and explores an alternative approach for the commune.

1. Privatization and environment in the current reforms in Vietnam

A keystone policy of economic renovation (*doi moi*), endorsed by the Vietnamese Communist Party at its Sixth Party Congress in December 1986, was a shift away from command economy model toward a market system. A major feature of this policy was allowing households, whose bulk were rural farming households, the right to choose their own crop to plant, and/or craft activity to engage in, to sell their products directly in the market, and to appropriate privately the returns and rewards from these economic activities. (Kerkvliet 2005; Luong 2003). This meant country-wide de-collectivization, and the reinstitution of the family and the household as the most important economic unit, especially in the rural areas. This development would define in the years following the *doi moi* policy an important feature of privatization trend in the country.

Thus, in the 1990s privatization in Vietnam was characterized by rapid expansion of household enterprises rather than the growth of domestic corporate sector (Gainsborough 2004: 44). In a 10-year period, from 1988 to 1998, handicraft households among the industrial sectors categories of the countries registered a growth of 318,555 to 553,043 units (Luong 2003). These enterprises were mostly concentrated on trade, repairs and personal services. Craft production for export was also a major concentration of the private household enterprises. These range of household or micro-enterprise production had several things in common: their competitive advantage, low technical-technological requirements, and relatively low-start up costs (Giao and Cuong 1995).

By 2001, the number of formal private enterprises had significantly increased. Foreign direct investments (FDIs) too rose sharply, mainly in the form of joint ventures with state enterprises as local equity partners, pushing the private sector development to a new level. Despite the growth of these formal private companies, however, household enterprises registered in 2000 still numbered about 644,000 comprising a significant 11% output share of Vietnam's total industrial production. While the registered output contribution of this particular segment of the private sector might be much less than that of state-owned establishments (41% of output share), and FDI enterprises (35% of output share), its major importance lies in terms of human resource and geographic employment absorption. This particular segment not only employs a huge number of people, but also absorbs and makes more productive otherwise economically stagnant rural and peri-urban areas of the country. Furthermore, its significance is much more when one considers that compared to the other private or non-state business organization categories, this group has a huge intractable, non-registered household entities (Muller 2005). Further, formal distinction between household enterprises becomes blurred and the latter's size needs to be adjusted upwards when one considers that many farming households are also engaged in craft enterprises. According to the surveys used to assess poverty in the country in 2005, three quarters of households are involved in farming, and 38 per of which run a small business of one sort or another (a third are not related to farming) [VCG 2005]. While accounting for these activities is certainly difficult, these data clearly indicate that entrepreneurial activities of farming households are thriving.

Side by side with privatization reforms boosting industrial production, it is noteworthy that Vietnam has considerably improved the policy framework for environmentally sustainable development. Since the mid-1980s, the government of Vietnam has become more active in the field of environmental protection. Preparatory research projects and capacity building in regulatory and monitoring system, creation of reserve areas started during this period. culminated in putting in place a basic legal framework for environmental regulation in the country, the Law on Environmental Protection (LEP)[1]. LEP appears to be the enabling legislation that laid out the rights, responsibilities and structural relationships between ministries, political-administrative units, economic units and individuals through which the law will be carried out (Di Gregorio, Rambo & Yanagasiwa, 2003: 194-95). Concrete progress on the ground has been less however (VCG 2005: 122).

Particularly in the water sector, a number of laws and regulations have been issued by the Vietnamese Government to protect water resources. Instruction 487/TTg dated July 30, 1996 strengthened the state management of water resources. The

[1] LEP, among others, also required environmental impact assessments (EIAs) of new industrial plants and land use plans, authorizes the government to levy environmental taxes and charges, and the official issuance of ambient and source standards for various types of pollution and the necessary inspections to pursue compliance to these standards (Di Gregorio, Rambo and Yanagasiwa 2003: 195).

Law on Water Resources was enacted in 1998, followed by the Decree No-179/1999/ND-CP specifying the implementation of the Law. However, there has been serious limitations regarding the implementation of Laws. The Provincial Departments of Science and Technology (DoSTEs) have identified over 3300 polluting enterprises that cause water and air pollution (NEA/WB/DANIDA, 2002). For rural areas, the National Program for clean water and environmental sanitation in rural areas was approved in 1998. Targets for 2005 include 80 % of the rural inhabitants having access to clean water and 50% having hygienic latrines. Nevertheless, the majority of the breeding farms and the artisanal villages presently do not have facilities to treat their wastewater. Most of wastewater is directly discharged into fish ponds, canals and rivers without treatment, which in turn affects adversely local people's health and the environment.

Compliance and enforcement of environmental regulatory standards of private industrial companies remains problematic. This has been concluded in the following studies on the environmental performance of corporate industries. O' Rourke (2002) discussed how how air pollution by private industrial companies operating outside export processing zone, in the form of boiler gases, soot and dyes, has caused respiratory problems among residents of neighboring residential communities. On the other hand, Minh (2002) found out that considerable environmental pollution are also committed by private industrial multinational companies operating mostly in industrial zones and export processing zones, where regulation and environmental infrastructures are better than those of private companies located in unplanned and non-industrial or residential areas . However even in these industrial and export processing zones, as for example in case of Ho Chi Minh city, wastewater treatment facilities for one have scarcely been in good and consistent operations. It has been argued that because industrial zone management boards are under pressure to attract new enterprises and keep existing ones by any means possible, they frequently expedite permitting, including environmental impact assessments (EIAs). Further, though mandated to comply with environmental regulations, management boards often act as "screens between Department of Science and Technology, and the Environmental (DOSTE) monitors and individual firms within their sites" (Di Gregorio, Rambo & Yangisawa, 2003: 182). Intervention by management boards has often blunted compliance by industrial companies to regulatory standards set. These deficits in wastewater management by the corporate industries particularly in Ho Chi Minh have contributed hugely, together with untreated domestic wastewater to the critical level of pollution of Saigon River (Sajor and Thu: 2009).

What has not been covered by recent studies related to privatization and environment in Vietnam has been the domain of household-level manufacturing or craft production (for a few exceptions, see DiGregorio et al. 1999; Ha, Kant, Maclaren 2008) There are important reasons though why this should be an important focus of study of privatization and environment in Vietnam. First, as mentioned earlier, private household-level craft production continue to constitute a most pervasive and important aspect of privatization and economic reforms, particularly in terms of providing employment in the rural and peri-urban regions. Second, as economic units and actors, households and its members are known to act in a manner that puts consideration to basic livelihood interests and gains first while subordinating environmental and health costs. Third, the diffused character of this micro-scale manufacturing process create environmental burdens both to producer and non-producer households and entire communities, and therefore disentangling residential and manufacturing functions that combine within a household poses a special challenge to spatial planning and community-wide development. Fourth, effectively managing pollution in craft villages, especially industrial waste water, implicates the issue of conflict-laden relationships between the right of households to livelihood, the right of communities or settlements to a liveable and healthful environment, and the right and duty of the state to safeguard 'public' water resources from degradation.

2. Background and profile of a craft village: Man Xa village

Craft villages have had a long history and role in Vietnamese national development. They are a typical feature in the social, economic, and cultural tradition of Vietnam, particularly in the countryside and, more recently, in the peri-urban areas of the country. They have made significant contribution to economic development and to changes in the national economic structure, especially in terms of enhancing local incomes and employment in the villages. Hence government policy makers have put special emphasis on the development of craft villages as part of its employment and rural development strategy (Digregorio et al. 1999; Ha, Kant, MacLaren 2008). Over the past decades, many craft villages have started to recycle waste materials. In Vietnam today, there are three types of recycling craft villages: plastic recycling, metal recycling (foundry villages) and paper recycling villages.

In the Red River Delta region, after the introduction of the economic reforms, many villages redeveloped their specialized craft occupations as a means of improving their livelihoods. These villages had traditionally been engaged in artisan, craft and trade activities for decades in addition to their agricultural activities. But majority of these activities disappeared during the co-operative pre-*Doi Moi* era. However, since the 1980s, these occupations, customarily grouped into handicrafts and small craft industries, have grown at par with other industries. According to government sources, craft villages exhibited growth rates (measured in the value of output) of roughly 8% per year in the period between 1988 and 1998 (State Support, 1998). In the provinces surrounding Ha Noi, where a few important village industry clusters dominate, provincial rates of growth have generally been higher. Between 1996 and 1997, there were more than 178 craft villages and commune clusters in Ha Tay, Bac Ninh and Hung Yen Provinces (Ba, 1997; Cuong and Nguyen, 1998). In some villages, these activities have become "traditional craft" with valuable products such as paper, iron/copper products or sculpture in Bac Ninh Province, plastic tools in Hung Yen Province, and pottery in Ha Noi City, among others. These non-farming activities generate jobs for local farmers, especially during leisure time and farm labor slack period. These industrial villages, as both processors and producers, have provided much of the demand for recycled materials. The virtuous cycle of rising demand and increasing supply has, in effect, meant that nearly all recyclable materials that appear in Ha Noi's economy eventually find their way into production (DiGregorio et al., 1999).

2.1 The Study Site

Van Mon Commune located in Yen Phong District, Bac Ninh Province is about 21 km Northeast of Ha Noi and is 7 km Southwest of Tu Son town. Van Mon is bordered in the north by Yen Phu commune and Cho town; in the south by Huong Mac, Tu Son; in the east by Cho town and Dong Tho commune, and in the west by Thuy Lam commune, Dong Anh, Hanoi (see Annex Figure 1. Location of Van Mon Commune). The commune is accessible by roads and waterways.

Van Mon has 5 villages, which are Quan Do, Quan Dinh, Man Xa, Phu Xa and Tien Thon. It has a total area of 424.84 ha, of which 268 ha is agricultural land, 65.1 ha is residential land, 91.3 ha is special use land and 0.38 ha is unused land. Van Mon has one primary and one secondary school, one health clinic, and one market that is opened every day.

The commune has a population of 9359 people and 1709 households (based on the 2005 census). The annual population growth rate is 1.65. Of the total population, 3762 or about 40% are in the working age. Seventy percent of adult workers are engaged in artisanal production and rice production, and 30 % are purely engaged in farming rice. On average, per capita rice production is 167 kg of milled rice/6 months.

Van Mon has a long history and culture. Elderly individuals within the commune have experienced life under three regimes: the French colonial government, the Japanese occupation, and independent Vietnam. war, women did not only actively participate in agricultural production, but also joined the army to fight against the US military forces as men did. During the *Doi Moi* reforms, tradition of hard struggle and hard work has been brought into play in the market economy to improve their livelihoods and household economy.

The average rainfall in the area varies between 1240 and 1598 mm per year. The rainy season often coincides with the prevalent period of the southwest or southeast wind (between May and October) accompanied by atmospheric turbulences (including tropical convergent strip, typhoon, tropical low pressure), creating long lasting medium and heavy rains (Bac Ninh DONRE, 2005). Rainfall during this period makes up about from 75% to 80% of the total annual rainfall. Rainwater creates a surface current, a part of which infiltrates to enrich the ground water in the area. Thus, rainwater provides a considerable volume of water for production and daily activities of villagers; it is also a medium for spreading pollution.

Dry season, on the other hand, lasts six or seven months from November to May of the following year, when rainfall is very little, accounting between 15% and 20% of the total annual rainfall. In some years, there are no rains at all for a period lasting 3 to 4 months. March is the month that has the lowest evaporation level in the year of 67mm. During the dry season, oil and iron concentrations in certain points of Ngu Huyen Khue River and the sewage canals are much higher than during the rainy season. On the other hand, as we will elaborate in a latter section, for certain other parameters of pollution it may be higher during the rainy season, an indication that surface flow during heavy rains collects others pollutants from a wider area outside of the village.

Flowing through the area of Van Mon with a length of about 2km and joining the Cau River in Van An commune of Bac Ninh province is Ngu Huyen Khue, an inland river originating from Chau Khe commune (Tu Son district). The river provides water for 5 districts including Yen Lang, Dong Anh, Tu Son, Yen Phong and Tien Du. The Ngu Huyen Khue River is between 50 and 70 m wide with a water flow of $60m^3$/second. In the rainy season, the water level of the river fluctuates from 3 to 10m depending on the area. The river's water is used for irrigation purposes. It also receives waste sources of various types from the area.

2.2 Development of Van Mon's craft village

Aluminum melting actually started under the French era in the neighboring province of Bac Ninh, in Hiep Hoa, Bac Giang, but it was easily adopted by Man Xa village, which has a long history of craftsmanship[2]. From here it spread to the other villages of Van Mon commune. It is said that Mr. Hoang Duc started the craft by making pans from the body of an American airplane shot down in the village in 1963. (These pans later came to be named after him.) Then in 1965, aluminum melting was developed and spread to the whole village, and by 1967 an aluminum melting cooperative became established. With the cooperative's formation, households did not produce pans on their own anymore. Instead, they were formed into production brigades, which were under the management of the cooperative.

However, the collective model revealed many limitations and mistakes, such as poor management skills of cooperative cadres, poor distribution of goods and reduction in cooperative members' income. Therefore, in the early 1980s with the collapse of the cooperative model, household-based artisanal production increasingly displaced cooperatives (DiGregorio et al .1999; Luong 2003)

Although the *doi moi* adoption as an official national policy occurred in 1986, years prior to this many villages both in north and south regions of the country have already been shifting to their attention to household-based private economic activity, and less priority on collective brigades. In many cases, this had the tacit sanction of local authorities (Kerkvielt 2005). Thus, in Van Mon villages in particular, by 1982 households had already started with privately operated aluminum melting and experienced properity. In addition, a number of households in the village also conduct lead, and zinc melting. In the last 5 years, Man Xa has expanded its markets to China. Villagers began melting aluminum bars for factories, plants and to export instead of making pans for the domestic market. This is partly because more and more households in Vietnam today use electric rice cookers instead. More importantly, aluminum bars brings higher profits. In 1995 junk trading was also started and developed in Man Xa. Villagers usually buy junks from other provinces and after sorting them out they sell them to households that are engaged in melting or to people elsewhere outside the commune.

Economic reforms (*doi moi)* were introduced in 1986 in Vietnam, which included the elimination of the cooperatives' monopoly and encouragement of privatization and market liberalization. The reforms have dramatically improved living conditions in Vietnam. Since *doi moi* started many households in Van Mon decided to separate from the cooperative and privately invest in aluminum and metal melting to develop their household economy.

2.3. Metal recycling, water use, and waste water and other pollution discharges

At present Man Xa is engaged in aluminum and color metal melting. The main product of the village is aluminum bars. Main materials used for production of these bars are various types of aluminum scraps. In addition, villagers also produce pans and pots, which are purchased by ethnic minority people. In Man Xa at present, there are more than 200 households in engaged in this industrial activity. Table 2.3.1 below shows figures of aluminum outputs of Man Xa. To produce these outputs, an amount of 8000 tons of aluminum scraps and 1200 to 1500 tons of fuel are used per year.

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[2] Man Xa started its silk weaving as far as Y Lan's time during the Ly Thanh Tong dynasty (1023 – 1072). At the time, villagers made long dresses and brassieres. In addition, they were engaged in making tofu and alcohol and agricultural production. But from 1958 to 1960 fabric weaving fell into oblivion.

Table 2.3.1 Outputs of aluminum production in Man Xa

Product	Output per year (ton)
Melted aluminum:	400 to 500
Metallurgic aluminum:	4000-5000

(Source: The provincial Bac Ninh report on the current status of the environment)

In the past, villagers in Man Xa commune used only clean aluminum as the material for melting. The production chain therefore was relatively simple. Clean aluminum was melted and poured into forms for casting. Main products of this process were home utensils hand crafted by village households. In the last ten years however a variety of similar but better designed and factory-made items (commnlhy made of other materials, such as glass and stainless steel), have dominated the market. The market demand for aluminum home utensils products made in the village has diminished. As a consequence, the majority of villagers have switched to simply producing aluminum bars from melting aluminum scraps. Crafting recycled aluminum into finished product utensils have become very limited.

Aluminum scraps vary in type and size. They can be divided into two main groups:

- Consumer product aluminum scraps (e.g.) empty cans, aluminum frames, pots, pans, etc.) .
- Production aluminum scraps (e.g. parts or pieces of machines or equipment made of aluminum alloy)

Both have been used by local households. But the main material group to be used depends on the scale of household production. For medium and large production scale households, consumer product aaluminum scraps are commonly used. Although this type of scraps are more expensive, aluminum recovery is relatively greater, at 80 to 90%, with small amount of slag. For small production scale households, which have less operational capital, production aluminum scraps, mostly alloys, are their choice, since these type of scrap materials cost However, the aluminum recovery rate from this type is lower, which is from 50% to 60%, and with a lot of slag.

Aluminum scraps are brought by scrap merchant in trucks to the village. These are then purchased and sorted out by artisan households. On the other hand, merchant buyers also regularly purchase the finished product aluminum bars of households. They are transported by trucks from the village, where they are purchased by factories in the cities or exported abroad as semi-processed raw materials.

In household based aluminum melting, the technology is backward. Fuel used is coal dust and fossil coal, with a production norm of 80-100 kg/100 kg of aluminum products. With an average of production of 80 kg per household per day, and with 70 percent of households involved in production, the village utilizes some 17,000 kg of coal each day.

The aluminum production process in the household has seven main steps as described below (See Annex Figure 2 Aluminum Production Chain):

1) Washing and preliminary treatment of scraps. (This use water and produces waste water)
2) Melting of scraps in primary pot

3) Pouring of molted aluminum into primary moulds (rough moulding)
4) Transfer of moulded aluminum to a secondary pot for continuous melting.
5) Pouring of molten aluminum from secondary pot to moulds for forming bars
6) Cleaning of moulded bars in a basin
7) Finished bars are prepared for sale and transported outside the village.

There are two auxiliary steps involved that links or flows from certain main steps. These are the following:

- Slag produced in the melting of scraps in primary pot (Step 2), which still contains aluminum materials, is transferred into a filtering tank. The aluminum retrieved through filtering is put back again in the primary pot. (Step 2 also produces semi-processed aluminum products which may be used as inputs for other aluminum production).
- Continuous melting of aluminum in the secondary pot (Step 4) produces slag, which are dumped on the ground.

Water is used, and waste water is generated in washing of scrap materials (Step 1); in filtering slag for further recovery of residual aluminum contents (auxiliary of Step 2); and in cleaning of molded bars in a basin (Step 6), just before they are ready for selling. On the other hand, solid waste is produced in the form of dumped slag from as a waste of melting in secondary pot (Step 4). Further, a large volume of toxic gasses of various types is formed and dispersed to the surrounding environment (See Annex Figure 3 Production Chain of Aluminum Bars and Wastes).

In Man Xa, water used for manufacturing comes from drilled wells and irrigation canals. In the past, a fairly large amount of water was utilized for cleaning materials and cooling products. Compositions of discharged wastewater depend on the type of materials. Recently, water used for the manufacturing process has remarkably been reduced. Some households even do not utilize water for production. A number of households have changed to mainly aluminum melting, a process that does not require cleansing of scraps. Instead, scraps are placed directly into melting pots; molten aluminum is then poured into moulds and naturally left cool without using water for cooling.

According to a study, materials used for aluminum recycling mainly comprise cans and old/broken pots (Dang 2005). Thus, key compositions of wastewater discharged during this stage contain a mixture of dirt from cans. For cleaning production aluminum scraps, discharged wastewater have toxins and oil. Further, based on survey results, the average amount of water used for production is 1.2m^3/ton of aluminum products.

A number of products that need surface processing cause wastewater containing some acid, base or chrome compound. In addition, plating also discharges a great amount of wastewater that causes pollution (wastewater normally has low pH, containing many metal ions). Cinder filtering also causes wastewater with a great deal of heavy metals. Concentration of manganese (Mn), nickel (Ni), and zinc (Zn) in wastewater after cleaning of finished products are much higher in concentration compared with those in wastewater discharged in the process of cinder filtering. Meanwhile, the aluminum concentration in wastewater discharged from the cleaning is lower than that of the wastewater discharged from the cinder filtering.

At present, recycling of other types of scraps, such as lead and zinc, has also started in the village. A number of households are also not only engaged in trading scraps for aluminum manufacturing but also other waste materials from broken machines/equipment, electric cables, used electronic materials, and batteries, among others. After being sorted out they are then sold to manufacturing households or elsewhere outside the commune. Water used for the cleaning of waste materials/scraps would afterwards contain oil, chemicals, and dust, therefore accumulating into high concentrations of oil and toxic chemical pollution. At the same time, wastes from aluminum melting have been disorderly discharged and piled up together with other types of wastes/scraps all over the area in the village. Since they are not covered by anything, they are swept away by rainwater, thus seriously polluting the village's water resources.

The wastes produced from manufacturing activities mainly include cinder, broken metal scraps and gases from kilns (Dang et al., 2005). Gases have abundant toxic components such as aluminum gas, COx, SOx, and NOx. Such substances as SOx, and NOx emitted into the atmosphere would turn into nitric acid (HNO3) and then fall on the ground, and into lakes, ponds, rivers and streams. This is the acid deposition process. Consequently, in addition to the direct impacts on human health, these gases are main causes of acid deposition phenomenon, adversely affecting water resources.

3. Livelihood vs environment and health

Metal craft occupation has brought livelihood security and a certain level of prosperity to Van Mon villagers. However, along with economic benefits have come negative environmental and health impacts that threaten this acquired benefits itself by people in the locality.

3.1 Livelihood and income stability

Results of field survey conducted by the researchers on the valuable possessions of households in the village suggests a certain level of prosperity by rural and semi-rural standard of living in Vietnam. Two of ten rich households and three of 16 upper middle households sampled have trucks. One of ten rich households, two of 16 upper middle households and all households in the poor group have cars. Respondents in the middle group are the only ones whose households that did not own any trucks or cars. All of the sample households had motorbikes, TV sets, video, refrigerators, radios, furnaces, electric fans, gas stoves.

The indebtedness profile of households in the village similarly suggests relative stability of income sources. Based on survey conducted by the researchers in 2006 of households that borrowed during that year or had been in debt in the previous year, majority of households in the rich, upper-middle, middle groups and all households in the poor group were able to pay back their loans and had no debts anymore. (See Fig. 3.1 below.) The figure also shows that rich households borrowed the highest amount of money (VND 16.5 million per household), followed by the upper middle (VND 14.3 million per household) and then by the middle (VND 2.1 million per household). In general, however, all households in the four groups did not borrow money higher than their annual income. Households did not also find it difficult to pay back their debts either.

Out of the total 474 households in Man Xa, 235 (50%) are engaged in aluminum and metal smelting. Based on the sample surveyed, major significance of metal melting and junk trade in the livelihood portfolio of households in all socio-economic groups is undoubted. (See Annex Figure 4 Profile indebtedness of households.)

Unlike any other agricultural communes in the Red River Delta the majority of villagers, except for those in the middle households in the craft village of Man Xa, do not earn income from sales of agricultural produce or animal husbandry. Households in the middle group are also those that earned most from high-return occupations – aluminum and metal melting, and junk trading. They are followed by the rich households, which earn from metal melting, by the upper- middle, and then by the poor respectively in terms of earnings from metal-related occupations. On the other hand, the poor households earn the next most from junk trade, followed by the middle and then by the rich. The upper-middle is the only group that has households engaged in both aluminum and metal melting, and junk trade. No group of households draws income from state wage.

Table 3.1 Net cash income sources of different social groups of households/year/capita in 2006

	Rich (VND)	Upper-middle (VND)	Middle (VND)	Poor (VND)
Metal melting	7,466,667	6,383,333	9,285,714	5,000,000
Junk trade	6,514,286	7,815,000	9,866,667	8,000,000
Metal melting & junk trade	0	5,833,333	0	0
Other	0	0	5000000	0
Total	**13,980,953**	**20,031,666**	**24,152,381**	**13,000,000**

The data in Table 3.1 above further show some more interesting patterns. Unexpectedly, the rich households are not the ones who earn the most from all sources[3]. The middle group households are the ones that earn the most from all sources, followed by the upper-middle. By engaging themselves in non-farm sources of income and in both aluminum and metal melting, and junk trade the middle and the upper-middle have optimized their earnings compared with the rich and the poor households. The data also demonstrates that incomes from non-farming activities are much larger compared with a meager income earned by a rice farmer (VND 5 million per capita per year). This also explains why despite the majority of people interviewed during the field survey being quite aware of worsening water pollution in their community, they are still willing to continue and expand aluminum and metal melting.

3.2 Water resources degradation

According to village informants, about twenty years ago up to 95% of households used water from dug wells of 10-20 m deep. In the last 10 years, all villagers had switched to using water from drilled wells with average depth of 40-45m. They

[3] Although a caveat to this is that heads of the rich households might not have correctly reported their incomes in our survey.

realized that the quality of the water that they were using had gotten worse, and thus they dug deeper for getting better water quality of water. During the time of this field research, it was observed that many households have drilled wells of 90-95 m deep.

Furthermore, according to elderly people in the village, some years ago there were still seven or eight fishponds, whose water quality was still good for raising fish despite the fact that these ponds also served as wastewater receivers. Today, there are only three of these ponds left, one of which is heavily polluted. As far as fifteen years back, according to informants, the village had a common well too, which was 7m wide and whose water was reportedly good. This well was filled in 5 years ago due to the bad quality of water.

At this point, one might wonder why water quality was still generally good yet the villagers at the time were already engaged in aluminum melting. While local households around two decades or so ago did already engage in aluminum melting their number were small. (The village's population too was small.). At present, the population has dramatically increased. More importantly, due to far greater market demand, many households today have been intensively engaged in the craft industry. They are also not only into aluminum, but also zinc and lead melting, which further intensifies water pollution.

In Man Xa, large volumes of wastewater are increasingly discharged into the environment. It is a typical densely populated craft village. Large amounts of water are used for domestic activities and animal husbandry purposes and discharged without any treatment. Likewise, huge volume of industrial wastewater is also discharged directly into the local water bodies also without treatment. All drainage canals in the village have not met the requirements of hygienic conditions. By the time the research was being carried out most of sewage canals did not have cover.

Drinking water

Household in Man Xa village have no access to the piped water. Local people rely on water from drilled wells or rain water for drinking and domestic use. They do not use water filters at all. The demand for clean water in the area is some 60l/person/day and night (DONRE/Bac Ninh Province, 2005). The average volume of water exploited is approximately 0.5m3/day/well. For drilled wells, the figure is higher, which is about 1.5m3/well/day. Rainwater is also one of the water sources that villagers like to use[4].

Based on water samples collected from both drilled wells and collected rain water current status of the quality of water used for drinking and daily activities exhibit the following characteristics:(1) the concentration for most heavy metals (except for iron) has not exceeded the standard for drinking water; however, iron concentrations in the two drilled well water samples are three to eight times higher than the standard level for drinking water; (2) microorganism parameters (total coliform), on the other hand, are lower than the standard levels; (3)only one out of the three water samples was found with H2S in a drilled well ((however, it is still within the permissible levels); (4) two samples of drilled well water were polluted by oil and concentration in one of the two exceeds the standard levels; (5) NH4+ concentration is high not only in the underground water but also in the rain water, exceeding the

[4] A few households, which are located near Van Mon's People's Committee (including the commune's health clinic), have been supplied tap water, which was under the program on Clean Water for Rural Areas.

standard level for drinking water[5]; (6) and BOD5 concentration in all the water samples is higher, 3-5 times exceeding the standard levels.

During the rainy season, the concentration of most parameters is lower compared with the one in the dry season. Yet, some parameters such as oil, total N, and H_2S are a bit higher than those in dry season. It is noteworthy that oil has been found in the rainwater samples. Nevertheless, the concentration of oil is still at a permissible level (0.008 mg/l). Oil was found in all collected samples (drilled well water and rain water sample). In addition, a number of parameters of BOD5 and NH_4^+ in the rainwater samples are lower in the rainy season when compared with the dry season, but still exceeding the permissible limits. Meanwhile, there is no difference in these parameters in the drilled-well water samples between those taken during rainy season and during dry season.

During the rainy season, the aluminum concentration in the rainwater of households that are not engaged in aluminum melting is quite high (0.9mg/l), exceeding the permissible limits for potable water (0.5mg/l). This can be explained by the fact that aluminum dust created during the manufacturing process scatter and fall onto the house roofs and finally draining into the rain water tank. Therefore, these households are still affected although they are not involved in the melting of aluminum. Meanwhile, those that are engaged in aluminum melting have lower aluminum concentration. It is likely that these households are more careful in the reserving of the rainwater and protecting it from being polluted by aluminum dust.

For almost all of the other remaining parameters, no distinct difference in rain water samples between aluminum manufacturing households and non-manufacturing ones has been observed. There is also no significant difference in these parameters in the drilled-well water samples and tap water samples. It should be noted that three out of 4 potable water samples (including treated piped water sample) is polluted by lead with a concentration, which is quite exceeding the permissible level (0.012-0.016mg/l compared with the standard level of 0.01mg/l). Attention should even be paid to piped water management, since some parameters including lead in the treated tap water sample are slightly higher than the permissible level. In sum, Man Xa villagers' potable water of rain and well water have strong signs of being polluted as shown in a number of parameters of BOD5, NH4 and lead. As a result, it is of great urgency to treat potable water resources to ensure that villagers have access to clean water.

Irrigation canal water and river water

Water, Based on samples from rice paddy and irrigation canals collected during the rainy season, water contains some heavy metal concentrations (like Zn, Pb, Hg and Cr concentration) [See Table 3.2.1 below]. But these are much lower than the permissible level for irrigation water (TCVN 2000).

Table 3.2.1 Selected Heavy Metal Concentration in Rice Paddy and Irrigation Canal

Parameter	Unit of measure	Rice Paddy	Irrigation canal
Zn	mg/l	<0.01	<0.01
Pb	mg/l	0.066	0.003

5 Contrary to common practice in the area, rainwater thus needs treatment before use.

Hg	mg/l	0.0001	2E-04
Cr	mg/l	<0.001	<0.001

As mentioned earlier, the Ngu Huyen Khue River provides an important water source for many socio-economic activities in the region, including for irrigation purposes. The Ngu Huyen Khe River flows through Chau Khe Commune (Tu Son District, Bac Ninh Province), where a well-known iron manufacturing village named Da Hoi and other artisanal villages like Dong Ky, Phu Lam paper (Tu Son District), and Phong Khe paper (Yen Phong District) are located. Most toxic substances coming from these villages are discharged directly into the river, which then pour into Van An water gate in Van An Commune, Yen Phong District before finally flowing into the Cau river. Untreated sewage is discharged into the environment, canals, ditches, fields and the Ngu Huyen Khue River.

Result of a survey of the quality of water at the Van Mon Bridge in 2004 (Bac Ninh DONRE, 2005) shows that during the dry season, the quality of water was not good and the concentration of polluted substances was higher. Results of water sample analysis from the researchers own fieldwork in 2006 confirm a much worsened situation. Concentrations of BOD5, NH4, Pb and Cu exceed the permissible level. During the dry season, the BOD5 concentration exceeds the permissible level though not much (16.5mg/l compared with the standard level of 10mg/l). However, during the rainy season, the BOD5 concentration increases dramatically in both river water samples – 4 times higher than the standard for natural water bodies, despite the water-current in the river being stronger during this time. It is possible that during this time the river water becomes not only polluted largely by local waste sources, but also by sewage discharged from upstream of the river.

Further, there are signs of heavy metal pollution like Pb in the water samples taken in the rainy season (0.075-0.013mg/l), which are higher than the standard for natural water bodies, but lower than the standard for irrigation water. The Cu concentration in most of the water samples is also higher than or as high as the permissible level for natural water bodies.

In sum, the water quality of irrigation canals, rice paddies, and the Ngu Huyen Khe River is still good for agricultural and irrigation purposes. Nevertheless, in terms of natural water, the concentration of some substances exceeds the permissible level. Effective measures to control and treat the quality of the river water are needed to conserve the quality of river water for a wider range of other purposes.

Drainage canals and sewage ponds

The concentration of certain substances in the water samples taken from sewage canals is quite high[6]. The concentration of COD varies from 238mg/l to 291mg/l, which is two or three times higher than sewage standard level of Type B. The BOD5 concentration is also very high - higher than the standard level of Type B and two out of which exceed the standard level of Type B. The concentration of ammonia is also very high, which is 51-90ml – 50-90 times as high as the standard level of Type B and 5-9 times as high as the standard level of type C, which must be licensed by

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[6] Due to the absence of specific standards for artisanal villages' sewage, we have used instead standards for industrial sewage – the Vietnamese standard 5945/1995 which is higher than the standards for household sewage – as the benchmark.

the authorities. Phosphorus total concentration is also higher than the permissible level though not very much. Generally, the metal concentration is not high. Most of them are lower than the standard level of Type A (except for Fe which exceeds the standard level of Type B). The oil concentration in drainage canals is higher than the standard level of Type B and C used for industrial sewage. One sample is 6 times as high as the standard level of Type C.

The village sewage ponds used to be ponds for agricultural purposes and daily activities. However, they are now seriously polluted. The metal concentration such as Hg, Pb, Cu exceeds the permissible level stipulated for natural water bodies. The concentration of Hg and Pb also exceeds the standard level of Type A. The parameters of organic pollution is very high, even higher than the standard level of Type A (BOD5) and Type B (COD) stipulated for industrial sewage

The result of the analyzed water samples collected drainage canals and sewage ponds during the rainy season shows that the concentration of substances in water samples taken in the rainy season is very high, even higher if compared with that in the dry season. The concentration of pollutant substances in water samples taken from the sewerage canal of non-manufacturing households is also lower than that of manufacturing ones. However, the concentration of almost all pollutant substances is very high, exceeding the permissible level for household sewage and industrial sewage of Type B.

It can thus be said that sewage canals of manufacturing households are seriously polluted even in the rainy season. The COD concentration approximates and exceeds the permissible level regulated for industrial sewage of Type C; the BOD5 concentration is 2.5 to 2.7 times as high as the permissible level stipulated for industrial sewage of Type C. The NH_4^+ content is also very high (8 times as high as the permissible level regulated for industrial sewage of Type C). These sewage samples contain some metals whose concentration exceeds the permissible level of Type A.

The pollution level in the sewage ponds in the rainy season is lower than that in the dry season. However, the organic pollution level is still high, exceeding the standard level of Type B stipulated for industrial sewage and much higher than the standard level for natural water bodies. Water in those sewage ponds is not safe for any other purposes. Moreover, the accumulation of dirt and toxics must be taken into consideration in the region's sewage management. Similarly, special attention should be paid to the management and the control of the pollution level in sewage canals. The situation calls for necessary measures to treat household sewage as well as production sewage before it is discharged into the village' drainage systems.

3.3 Impact on villagers' health, especially on women and girls

Due to the villagers' own low environmental awareness rubbish are thrown into the drainage canals, thus reducing their draining capacity. Further, organic wastes when degraded pollute the water. Out of 474 households, only 280 households have hygienic toilets. The rest did not meet the requirements of sanitation. This is also a major source of water pollution. Stagnant wastewater in the drainage system has caused unpleasant odor. During the rainy season, since the drainage systems do not function well, wastewater spills over from the canals into the village lanes, polluting the environment and posing risks to human health.

Man Xa's rapid development of craft industry, including associated demographic growth, and the absence thus far of solutions to effectively abate water pollution have combined to make the level of environmental pollution in the village a health hazard. All wastewater receiving water bodies are polluted at an alarming rate, thus posing risks to the environment and to local villagers' health.

To date, no technical research has been carried out yet to directly establish and explain the causal relationship between degraded water quality in the village and health status of the local population. However, indicators and signs strongly suggesting the negative impact of wastewater on humans have been ubiquitous in Van Mon. These too have increasingly become villagers' concern.

In assessing possible impacts of wastewater on villagers' health, 80 households heads were asked which water resources they used for what purposes. They were also asked to describe the quality of water resources. Further, they were asked whether there was any disease related to water that members of their household had contracted, and if their answer is positive, whether they sought medical treatment.

Regarding the aforementioned queries, the majority of those interviewed said that Man Xa's water resources are polluted. However, the impact of water pollution on villagers' health is claimed to be insignificant. Further, heads of 47 households were asked -- "During the past 12 months have members of your household suffered from any diseases or health problems?" Figure 5 (See Annex Figure 5 Diseases or health problems suffered by sampled households in 2006) shows that the majority of the rich, upper-middle and the middle claim not to have any health problem at all. The minority of these groups and all the poor group however admit to suffering from having a cold and respiratory problems.

However, an inspection of the Van Mon's Health Clinic's records show a contrary picture. Man Xa villagers' visits to the health clinic have been increasing annually (see Table 3.2). In addition, because in actual practice, local villagers have also normally gone elsewhere to seek medical treatment, the real number of households who have sought medical treatment would obviously be higher than the figures below.

Table 3.2 Man Xa villagers' visits to Van Mon Health Clinic

Year	2001	2002	2003	2004	2005
Visit	547	598	625	670	725

(Source: Van Mon Health Clinic's records in 2006)

The number of deaths in the village had considerably increased when years 2004 and 2005 are compared (see Table 3.3.2 below). The cases of death while giving birth and of infants in 2005 were two to three times as high that the preceding year. The number of people contracting diarrhea also increased by 200, majority of them were children. While the data below presents only two consecutive annual periods and not enough to present a time-series trend, still the increases are significant and do urgently need further investigation.

Table 3.3.2 Diseases and health problems in Man Xa in 2004-2005

STT	Type of disease	2004	2005
1	Number of death while giving birth	2	8
2	Number of common death	43	76
	At home	36	40

	Elsewhere	7	36
3	Death of infants	5	10
4	Miscarriage	3	5
5	Diarrhea	426	601
6	T.B.	713	748
7	Food poisoning	5	15

(Source: Van Mon Health Clinic's records in 2006)

Table 3.3.3 shows the number of deaths due to cancer for the last 4 years. It was reported that the majority of those who died of cancer were between 50 and 60 years of age and the majority of them were men (22 men) and the rest were women (15 women). The causes of cancer have not yet been specified. However, the number of those who had cancer had increased year by year (based on interviews with the head of Van Mon's health clinic). One likely causal explanation posited by local health specialists is the worsening environmental pollution in Van Mon. What lends plausibility to this reasoning is fact that the number of those who died of cancer and of those who contracted other diseases in Van Mon was between 2 and 3 times higher compared to the number of other communes in the district that are not engaged in artisanal activities (Yen Phong District's Health Center records).

According to public health specialists, polluted water is the main reason that causes stomach and intestinal cancer.

Table 3.3.3 Number of deaths due to cancer

Type of cancer	2003	2004	2005	Up to 6/2006
Stomach/intestinal	2	3	4	2
Lung	4	3	6	1
Other	3	4	3	2
Total	9	10	13	5

(Source: Van Mon Health Clinic's records in 2006)

Further, interviews with the head of Van Mon's Health Clinic reveal a number of alarming health information. The number of villagers visited the health clinic for medical treatment was from 1.3 to 1.5 times higher than those of other communes. The majority of those who had pollution-related diseases of the respiratory were children (accounting for 75%). Death of expectant mothers and infants was mainly caused by premature birth. In 2004 there were two cases of embryo death and 4 cases in 2005.

When the head of Van Mon's Health Clinic was asked about common wastewater related diseases, she said that these are skin diseases such as rashes and allergy. According to her, the number of people in Van Mon who acquired these diseases is three times higher than in other communes. However, the commune's Heath Clinic did not have the complete supporting data, since villagers did not always come to the clinic for medical treatment for this disease. Instead, they usually had self-treatment at home or bought medicine and then applied it themselves.

The head of the Van Mon's clinic also believes that stomach cancer is being caused by local water pollution. She recalls that in 2004 eight people, three of whom were children under 10 years, contracted chemical poisoning. The circumstance was that their households were engaged in the trading of junks that had chemicals, which were not carefully checked before being sorted out. It was reported that the eight people were sent to a hospital in Hanoi where they spent two weeks before they made a full recovery. In 2005, there were two more cases of chemical poisoning. This demonstrates that scraps contained many toxic chemicals that were not carefully checked by villagers. When they are washed, toxic chemicals, such as acid, mercury, herbicides and other toxins, pollute local water resources. Further, according to the same informant, two families in Man Xa had two babies who died when they were above one year of age. It was reported that they were affected by toxics and even dioxin in the junks. However, no scientific study and evidence has verified this incident.

There is no evidence so far of any significant gender differentiated health impact of local water pollution or bad water quality. It would seem that the condition is of the nature of general health concerns. However, because of their distinct role and exposure to certain craft activities women have become likely victims in Man Xa in craft occupational accidents. According to key informants, during the last three years there have been five cases of explosion occurring and victimizing workers melting aluminum, who in the village the majority are women. The consequence is that five women who were in the late twenties and early thirties lost their eyes. Some others had their thighs being injured or burned. It is important to note that all these women were not on health insurance. Further, while working they have not been provided protective goggles nor work clothing at all. Those who lost both eyes are the most difficult cases. The burden to support the family is now placed on the husband's shoulders.

In sum, there are many and strong indications of in Man Xa's water pollution impacting on villagers' health. The number of people who have died of cancer and have pollution-related diseases of the respiratory and intestinal systems is increasing. Women and children have been adversely affected. Although there is no scientific evidence to show that women have been more affected by water pollution or bad quality of living and drinking water they have become victims of the development of artisanal activities in the village. Since villagers' awareness is still low – and perhaps too because of their own material stakes in the craft production -- they have not realized nor highlighted the impact of water pollution. But records of the clinic and health experts' opinions strongly point to the contrary.

Conclusions

The particular case of Man Xa craft village discussed here mirrors the major tension between private sector development and environment and health agenda unfolding in the context of Vietnam's current chosen path of rapid industrialization and economic growth. While such a tension is also present in the operations of private corporate industries (as well as state-owned industries) in the country, the pervasive, diffused and virtually intractable characteristics of household-level manufacturing in craft villages create particular and unique difficulties in solving the problem through the use of simple state-centric or top-down official planning and regulatory policy instruments.

At the core of tension between private household craft production and its environmental costs is the right of people to livelihood pursuits and their notion of natural water bodies as common goods. In the case discussed here, for example, the Ngu Huyen Khue River, which provides an important water source for many socio-economic activities in the region (including irrigation purposes, canals and other ponds in the commune), is considered a common property. Villagers therefore discharge wastes directly into this water body, which is the cheapest way for their waste disposal. Perhaps they do care that their behavior would in turn adversely affect their health, but certain pragmatic considerations such as, for example, food security, may blur urgency and importance of their health stake. The farmers' mentality and the lifestyle of small producers push them to look at the short-term profits and ignore or de-prioritize for action the longer-term and wider benefits, and persistent effects of pollution.

On the other hand, the enforcement of environmental law is weak and, more importantly, there are overlaps and no clear mandates between relevant ministries and branches and between ministries and branches and the localities. It is also very doubtful if simple command-and-control legal instruments and enforcement techniques can be effective at all in tackling pollution of private household-size and micro enterprises. In Vietnam, if enforcement of environmental laws and regulations is already a big problem vis-à-vis private corporate firms, such is a bigger – and perhaps an insurmountable -- problem *vis-a-vis* millions of household scale craft production units that are spread over a wide area and operating with a large dose of informality.

That there are no easy government-imposed solutions to the problem was recently highlighted by a failed plan in 2005 made by the Bac Ninh Provincial People's Committee to designate, relocate and concentrate villagers' workshops in a special 35 ha area for craft activity of 300 households. The plan was resisted by villagers, and government failed to force them to move their workshops into a new area whose creation would have required them to give up most of their agricultural lands and retain only a small portion amounting to a seventh part of their lands. A second alternative plan currently under study by the provincial government is to limit the size of a new manufacturing site of the commune to 5 to 10 ha, in order not to dislocate other agricultural lands in use. According to the second plan, formal registration as enterprises at the district level would be required for every household in order to operate in the new manufacturing site; those failing to do so would be banned altogether from household-level craft manufacturing.

In connection with the second plan, a local office of the environment has been set up recently. This office has obliged all producers in craft villages to have environmental licenses, which are issued by the provincial Department of Natural Resources and the Environment. Those failing to do so will not be able to transport scraps and products into or out of the village. More importantly, their clients cannot buy their products, if they don't have a license. According to the villagers in Van Mon, the province has not issued them licenses simply because the provincial government wants to move their workshops out of the village (a residential area) to a concentrated production area. This concentrated area does not exist as yet however. While this new hardline policy might force households to comply with the environmental law, on the other hand, the same might force small manufacturing households out of business, leaving the field only for large producers.

While state-centric and command-and-control regulatory measures alone provide little hope to effectively manage the problem, letting households alone to devise their own solutions is a non-starter option either. Aside from their own resources limitation, as the Man Xa case shows, households as micro economic agents tend to be trapped in immediate livelihood and economic gain consideration that have thus far blurred or ignored longer-term environment and health trade-offs. Further, the case also shows that economic reforms have opened up opportunities for many, but have not benefited the entire community. Although the gaps in income may not seem excessive, new access to productive resources have laid seeds for continued rapid social differentiation in the future. The village is stratified and response to market demands has been different for individuals, While recent experiences of transition economies confirm that socio-economic inequality is quite unavoidable in market reforms, excessive inequality and exclusionary development, of course, is undesirable and can be a major block, among others, to achieving environmental sustainability goal. Thus, growth-driven social stratification in the context of liberalization of the economy and market reforms may also encourage atomized, individualistic orientations, and raise the hurdle to realize collective inter-household and community cooperative consensus and actions for managing the public good, a necessary, factor to effectively address the pollution in craft villages.

In Vietnam. renovation reforms have undoubtedly set an unstoppable momentum for local communities and households to enhance their productivity through private household-level production. To a large extent, strong momentum of household economic initiatives have pulled many out of poverty especially in the rural and peri-urban areas, and started them out on a track of upward social mobility. But, at the same time, this momentum of privatized household craft production has also created new and complex problems of environment and health impacts. The latter calls for new governance approach and mechanisms, which are obviously not in place yet. In the new governance approach, strong state regulation and effective enforcement is indispensable, which in Vietnam is still lacking in the field of environmental management, But more importantly, inter-household and community cooperation is an important prop not simply to exact minimum uniform compliance to statutory regulations and standards. Household and community cooperation and voluntarism are necessary to draw up responsive and enforceable environmental plans and standards at the local level, and innovative approaches and technology. For example, decentralized wastewater management proven to be effective in many peri-urban areas in developing countries involves decentralized decision-making and participatory planning and water segregation at source (that is, at household level). The same holds true for effective community-based health programs that emphasize prevention, protection and early monitoring of pollution-related diseases.

Thus far, however, households' and communities' roles in environmental governance in Vietnam have been on a large deficit. In sum, in the context of household craft production, local-regional governance of water resources would not only require effective state actions and instruments at both the central and local levels and, perhaps more importantly, engagement of community and households with the public authorities in collaborative and participatory planning and negotiated decision-making to handle the tension between household livelihood interests, community welfare, and ecological sustainability and macro economic goals pursued by the state. *doi moi* policy let individual households free to enhance their individualized production. It pulled many out of poverty, a major achievement by itself. Perhaps, it is high time now to energize and mobilize cooperative and community ethos in genuine partnership with the state, to take care of the environmental and health costs of *doi moi* in the peri-urban and rural localities.

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Annex 1.

Figure 1. Location of Van Mon Commune

QuickTime™ and a
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are needed to see this picture.

Figure 2 Aluminum Production Chain

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are needed to see this picture.

Figure 3 Production Chain of Aluminum Bars and Wastes

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are needed to see this picture.

Figure 4 Profile indebtedness of households

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BMP decompressor
are needed to see this picture.

Figure 5 Diseases or health problems suffered by sampled households in 2006

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Annex 2.

Some images of the metal recycling craft village in Van Mon Commune, Yen Phong District, Bac Ninh Province

Photo 1. Local people living together with sraps (unused wastes)

Photo 2. Furnace for melting scraps

Photo 3. Sewage gate used by Man Xa

Photo 4. Ngu Huyen Khue River running through the commune

Photo 5. Sewage gate of aluminium manufacturing households

Photo 6. Waste pond of Man Xa village

Photo 7. Agriculture area in Man Xa Village

Photo 8. Aluminium products

PN_67_2010_15

Gender relations, ethnicity and water insecurities in the Upper Ping River basin, northern Thailand[1]

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Table of contents

[1] In preparation as a journal article (Water Alternatives or Agriculture & Human Values)

Introduction

Women often have less access to water and related natural resources than men; what access they do have often depends on relationships with men. Differences in property rights between men and women are often an underlying reason for differences in access (Meinzen-Dick et al. 1997). Formal ownership rights and management responsibilities in irrigation, for example, often rest with men (Zwarteveen 2008). Men and women also have different needs and concerns in water use (Crow & Sultana 2002). Water is typically not just used for irrigation, but also for fishing, aquaculture, home gardens and livestock (Meinzen-Dick & Bakker 1999; Ols 1999; Smits et al. 2010). Irrigation water user groups often neglect the multiple uses of water and in doing so neglect the interest and concerns of women (Cleaver 1998). Although women may be farmers and water users they are often under-represented in water and river management organizations (Resurreccion et al. 2004; van Koppen & Hussain 2007).

Unequal representation may be a contributing cause to water-related insecurities experienced by women. In response more and more interventions by state agencies and non-governmental organizations look to increase the visible participation of women in water governance bodies. The challenges are often underestimated. There are a several common reasons.

First pre-existing gender relations often require sustained effort to change that goes beyond immediate water-management related issues and short-term recruitment and facilitation projects to establish new water user groups. Cultural norms with respect to what is considered masculine or feminine activities and thus the “proper” roles and tasks for men and women are not easily re-molded.

Second many interventions follow primarily an instrumentalist logic – increased representation of women it is argued would lead to higher production or more efficient water use or greater conservation of natural resources – rather than having empowerment of women or addressing skewed gender relations as their core objective. Increased participation in these situations may do little for gender equality if it just translates to more responsibilities and work (Ivens 2008; Resurreccion & Manorom 2007).

Third gender as a social category rarely acts in isolation of other ways of discriminating among people, in particular, socio-economic class, ethnicity or livelihood. Both self- and external perceptions of difference can impact rights of access and fairness of allocation. Again the specific attributions and assumptions made by one group of stakeholders about another are also likely to vary with cultural contexts (Pahl-Wostl et al. 2008; van Koppen & Hussain 2007).

Overall, gender relations are an important, but still relatively neglected dimension of efforts to expand stakeholder participation in water management. Gender relations, we suggest, are one of the important driver of social differences that underline water insecurities experienced by men and women (Figure 1). At the same time water insecurities, over time, may also feed-back to influence social differences and the evolution of gender relation, especially as livelihoods and socio-economic contexts shift. Either way improving understanding how women (and men) engage in conventional and new ‘participatory’ water management initiatives is important to addressing insecurities.

In this paper we assess efforts at two contrasting locations in the Upper Ping River Basin in northern Thailand to reduce water-related insecurities of men and women by individuals, households and through multi-stakeholder processes. The first site was in a peri-urban transition zone with several hundred years history of locally built and managed irrigation systems overlain with modern canals and management regimes (Lebel et al. 2007). The second site was an upper-tributary mountainous watershed in which sprinkler irrigation for cash crops has expanded among Hmong and Karen ethnic minority farmers, also with a long history of settlement. We focused on insecurities related to shortages of, and conflicts over, water in the dry season.

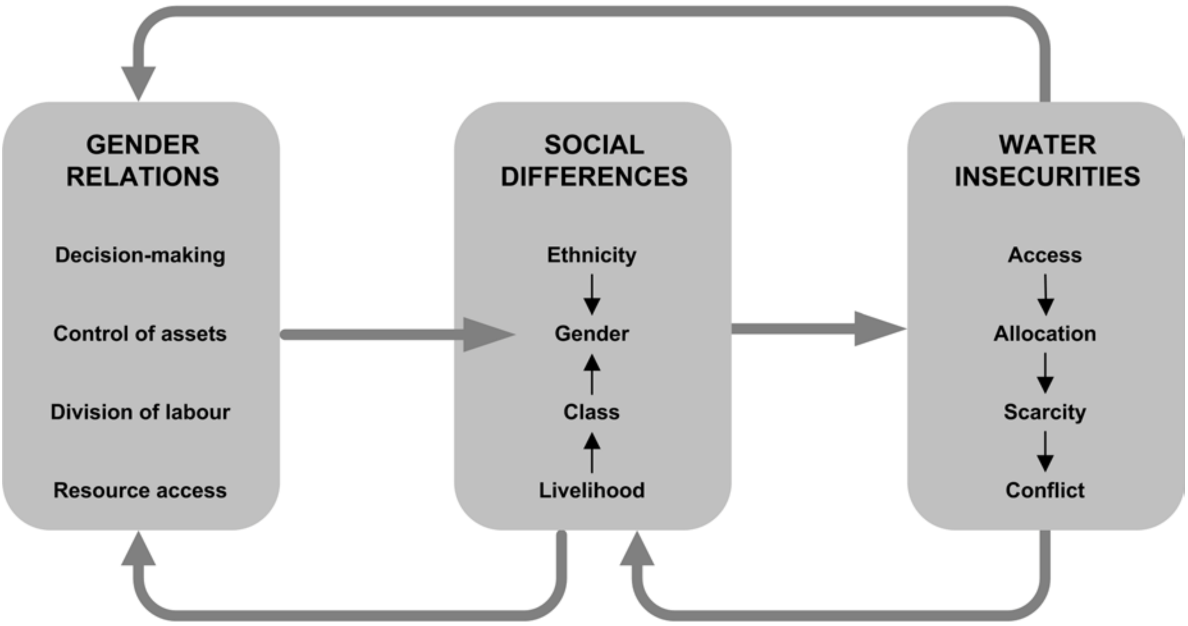


Figure 1 An initial, simple, conceptual framework for a study of gender relations, ethnicity and water insecurities.

We addressed three main questions:

What are the main gender differences in the use and management of water? How are these differences perceived and explained in different cultures?

How have water insecurities affected, and been influenced by, gender relations and ethnicity?

How have women and men of different ethnicities and authorities tried to reduce insecurities, and with what consequences for the vulnerabilities of women and men?

After description of our methods the rest of this paper is organized around each of these three questions.

Methods

Household survey

A sampling from for eight contiguous sub-districts in Chiang Mai province (see Table 1) covering the peri-urban transition zone was constructed from data provided by the Thai government agencies. We tried several sources and used that which we found most reliable and up to date.

In Mae Kuang, of the 505 household numbers listed in our randomly drawn sample from government lists 66 were not current: in 38 cases there was no house with that number, and in another 24 cases a building was present but had no occupants, and 4 cases it was the second household of someone already in sample. Of the 439 potential households in the sample we were unable to complete questionnaires in 39 instances. In 15 cases we were unable to make appointments and meet the residents that neighbours told us were normally resident despite repeat visits, including in evening or on weekends. In 9 cases the reason was that household members we met were physically incapable of responding to questions because of deafness, mental disabilities, alcoholism, or serious illness. In 15 cases households refused cooperation. Complete information was therefore collected from 400 households.

In Mae, the all households in the Upper Mae Hae Watershed were included in the sample. Of 709 household numbers obtained 84 were not current: in 42 cases we could find no trace of a house with that number, and in another 42 cases either house had been removed or if present was not normally occupied. We contacted village headmen to help search for homes in each village. Of the 625 remaining potential households in the sample we were unable to complete questionnaires in 39 instances. In 29 cases we were unable to make appointments and meet the residents that neighbours told us were normally resident despite repeat visits, including in evening or on weekends. This probably included a few individuals who simply did not want to participate. In 10 cases the reason was that household members we met were physically incapable of responding to questions because of age-related disabilities. Complete information was therefore collected from 586 households.

In-depth interviews

Interviews were collected using a standard interview guide including questions about water and natural resource management as well as gender relationships and roles. In Mae Kuang 14 women and 28 men were interviewed as follows: farming residents (15), non-farming residents (10), village heads (9), local officials (5), and experts (3). In Mae Hae 11 women and 17 men were interviewed as follows: farming residents (17), village heads (2), traditional leaders (2), water group leaders (2), and officials (5).

Interviewers worked in pairs. Interviews were carried out in either standard or northern Thai dialects in Mae Kuang and also in Karen in Mae Hae and later transcribed into standard Thai. Male and females informants were encouraged to talk openly and freely around water management, livelihood, insecurity and gender issues. Interviewers prompted for explanations and examples but avoided making judgements. Interviews typically took 30-45 minutes to complete.

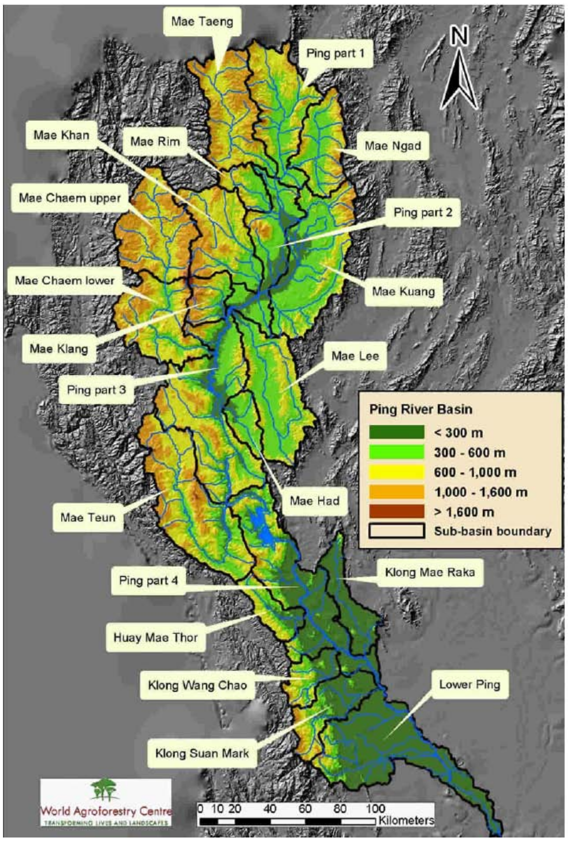
Interviews were taped and transcribed then imported into NVIVO software. Coding was done at two levels. The first set of codes was based on broad areas of inquiry. A second set of codes was developed based on themes emerging during the analysis. We also used key-word searches to dig more deeply into issues that turned up in early stages of analysis but which had not been coded in detail in earlier rounds.

Study Areas

Mae Kuang

The Mae Kuang watershed is one of 15 officially recognized sub-basins of the Ping river basin (Figure 2). It covers 2,734 km2 in four districts of Chiang Mai province and two districts of Lamphun province. Evergreen and deciduous forest covers just over half of the watershed (Thomas 2006), but is almost completely restricted to higher elevations. Average rainfall in the Mae Kuang sub-basins is just over 1100mm. Over 95% of water use is for agriculture and that use already succeeds storage. Seasonality is a key issue with irrigated areas served by Mae Kuang Dam in dry season typically less than a quarter of those possible in wet season.

Figure 2 Study areas. Topography and sub-basin boundaries in the Upper Ping river basin. (Source: Thomas 2005)



Our study focused on the upper parts of the basin lying largely within the inter-montane valley where water access is generally higher than further downstream. Access to water depends substantially on position within the Mae Kuang watershed (Ganjanapan & Lebel 2009). Doi Saket and San Sai district in the upper reach receive relatively more water from the Mae Kuang dam than lower reaches (Ganjanapan & Lebel 2009).

Dependency on agriculture varied moderately across the eight sub-districts in the peri-urban transition case study, Mae Kuang (Table 1). Those subdistricts with more households engaged in agriculture also tended to be more likely to have history of water conflicts (Nong Yaeng, Luang Nua) and those with least rural livelihoods (San Sai Luang, San Na Meng) the least frequent histories of water shortages. Low income households could be found in both lower and higher agriculture sub-districts.

Table 1. Spatial variation (across sub-districts) in basic indicators of livelihoods, wealth and water access and conflict histories at the household level in two case study areas.

Mae Hae

Mae Hae Watershed is located within the upper Mae Chaem river sub-basin (Figure 2) near border of Mae Chaem, Samoeng and Wang Districts, in Chiang Mai province, northern Thailand Expansion of dry season cropping made possible by technical innovations with PVC pipes, pumps and sprinkler irrigation has contributed to rapid expansion of cash cropping and resulted in substantial conflict over irrigation water among and within villages and ethnic groups (Hmong and Karen). Climate variability is an important factor in the severity of conflict each year, but so are other factors, like rising, or changes in patterns of, demand with crop choices and number of users or technologies.

In Mae Hae, the vast majority of households have agricultural income sources (Table 1). Half of all households had combined average cash incomes of less than 5000 Baht per month with some variation among sub-districts. Car, mostly pick-ups, ownership was high for mountain areas, but on average across the watershed lower than in the peri-urban setting.

Gender relations and ethnicity

Indicators of gender relations

Women in lowland Muang households, in general, are more likely to hold major assets than in upland households (Table 2). This is especially true for land where almost half is owned by women in lowland areas. In upland households both women and men take major responsibilities, but in lowland households this is more frequently a role for women. Decisions to borrow money more frequently involve both men and women in upland than lowland households but signatories on loan agreements are usually men whereas in lowland households a significant fraction of loans also formally involve women (Table 2).

Table 2 Some indicators of gender relations within households by ethnic group (% households)

Gender relations indicator	Hmong			Karen			Muang		
	Men	Women	Both	Men	Women	Both	Men	Women	Both
Owner of house	94	6	+	77	16	7	60	37	2
Owner of land	94	6	0	76	18	6	52	41	4
Owner of car	72	1	+	38	3	2	38	20	14
Pay household expenses	14	9	74	8	15	74	25	52	21

Bank accounts	22	3	16	16	3	7	6	16	10
Decisions to borrow money	6	0	54	11	4	67	23	18	26
Sign loan agreements	51	1	2	47	6	6	29	23	13

Gendered behavior

We asked respondents to score eight behaviors on a scale from very feminine (1) through netural (3) to very masculine (5). We analyzed scores using analysis of variance taking into account the gender and ethnicity of the respondent (Table 3). A value of 3.0 indicates agender-neutral means scores, with lower scores indicating femininity and higher scores masculinity.

The findings can be grouped into four patterns.

'To complain a lot' was seen as a feminine behavior by all groups. 'To follow opinion of others' was also seen as a feminine behavior but with some complex interactions between gender of respondent and ethnicity (Table 3).

'Think about, care for others' was overall seen as a more feminine trait by women respondents than men especially in Muang communities with overall average score near gender-neutral (Table 3).

The other five behaviors were seen as masculine to varying degrees (average scores > 3). Hmong considered the behaviors 'using physical force to win arguments', 'liking give opinions' and 'avoiding cooperation' more masculine than other two ethnic groups. For the latter two behaviors women respondents gave more feminine weighted responses than men (Table 3).

For the last two behaviors 'convince through reasoning' and 'think ahead, plan' female muang respondents scored these much more feminine relative to males than in other ethnic groups (hence the significant interaction term between gender and ethnicity). Hmong viewed these traits as more masculine, Karen somewhat intermediate, and Muang the least (Table 3).

Table 3. Means scores on the femininity and masculinity of eight conflict and cooperation related behaviors of men and women from three ethnic groups.

Behavior	ANOVA	Male Respondent			Female Respondent		
	F-Tests	Hmong	Karen	Muang	Hmong	Karen	Muang
Follow opinion of others	G x E * E *	2.55	2.71	2.86	2.59	2.89	2.66
Use physical force to win arguments	E	3.89	3.77	3.68	3.91	3.71	3.67
Complain a lot	Ns	2.04	2.21	2.13	2.01	2.16	2.21

Convince through reasoning	G x E ** E *** G ***	3.72	3.52	3.38	3.68	3.46	2.94
Avoid cooperation	G * E ***	3.72	3.48	3.27	3.58	3.47	3.07
Think ahead, plan	G x E * G* E ***	4.24	3.93	3.65	4.21	3.85	3.29
Think about, care for others	G x E * G *** E ***	3.06	3.09	3.03	2.86	2.98	2.70
Like to give opinions	E *** G ***	3.63	3.46	3.39	3.46	3.32	2.98

Division of labour

To understand division of labor we asked respondents how many times out of ten certain activities in their household were done by either men or women (which one was randomly chosen and unrelated to gender of respondent). The findings for 15 tasks are summarized in Table 4. The scores for men and women are therefore independent.

Tasks around the home are more often done by women, for example, cleaning the house, washing clothes, taking care of others, cooking meals and washing dishes (Table 4). Repairing homes is men's work.

Agricultural field activities are done by both men and women, but with men having on average a larger role in all three communities (Table 4). Preparing feed for livestock, however, is mostly women's work in upland, but more likely to be men's work in the lowland. Collecting fuel wood is done more by men than women in Hmong and Muang communities, but more by women in Karen households (Table 4).

The sum of average scores for men and women from a particular ethnic group may not be equal to 10 for a couple of reasons. Combined scores may be less than 10 because that activity is not widespread in that category of household, for example many Muang households are not involved in agriculture (Table 4). On the other hand a combined score for a near universal activity like "cleaning house" or "washing dishes" is more than 10 because both sexes tend to report the contributions of their own gender higher than that of their opposite. The difference is between women and men respondents is largest in Muang communities.

Table 4. Means scores out of 10 for frequency of activities of men and women from three ethnic groups.

Behavior	ANOVA	Men			Women		
	F-Tests	Hmong	Karen	Muang	Hmong	Karen	Muang

Repair house	GxE ***	9.18	8.74	6.96	2.06	1.98	1.99
Collecting fuel wood	GxE ***	6.50	4.78	3.43	4.09	5.39	2.33
Preparing crop land for cultivation	G *** E ***	6.37	6.28	2.76	4.68	4.26	1.10
Planting or taking care of crops	G *** E ***	5.64	5.64	2.59	4.64	4.72	1.29
Harvesting crops	G *** E ***	5.24	5.24	2.23	4.80	4.81	1.41
Selling harvest	GxE * G *** E ***	6.17	5.61	2.28	3.82	3.91	1.24
Preparing feed for animals	GxE ***	2.94	3.79	2.62	6.90	6.46	3.16
Cleaning house	G *** E ***	3.14	3.87	2.64	8.22	7.95	6.83
Washing clothes	G ***	2.42	3.20	2.55	7.30	7.10	7.08
Taking care of pre-school	G *** E ***	4.35	4.44	1.77	6.79	6.67	3.86
Taking care of school-age	G *** E ***	4.28	3.91	1.72	6.06	5.67	3.47
Taking care of elderly	G *** E ***	2.49	3.02	1.16	3.84	4.38	2.70
Fetching water for household use	G *** E ***	2.98	3.10	2.17	4.75	5.01	4.14
Cooking meals	G *** E ***	2.78	3.80	3.44	6.60	6.37	7.30
Washing dishes	GxE **	3.36	4.03	3.16	7.91	7.02	7.11

Apart from agricultural activities most households in Mae Hae collected a range of products from forest areas for domestic use but few to sell (Ratanawilailak et al. 2009). There are substantial differences in collection practices of men and women and between Karen and Hmong communities. Hmong woman, for instance, are renowned as experts in collection and use of forest herbs. Traditional knowledge is passed down among generations. In Karen households men have greater knowledge of forest herbs than women as they have more opportunities to enter forest areas.

Karen women are responsible for gathering fuelwood – a good fuel wood pile in a house with a daughter is interpreted as a sign that the women of the household are hard-working and is praised. In Hmong families fuelwood is gathered by men – if they don't it is a sign that men are lazy, but women will collect instead. Men collect timber for building houses and fences.

Men and women in both cultures collect wild vegetables from the forest. Hunting of large forest animals is done by men. Men won't eat animals caught by a woman because they say it will bring bad luck to the village. Women eat what they catch. Women usually hunt smaller animals like frogs and fish. Food and fodder for chickens and pigs is usually collected by women. Most of these gender differences are not absolute; for most there were significant fraction of households in which both men and women carried out the activity.

Water use and access

Men and women get water from similar sources that depend on locations: in uplands mostly from streams and canals, and in lowlands also public piped water supply.

Agricultural water uses are much more prevalent in upland rural Mae Hae than lowland per-urban Mae Kuang. But considering just those households using water for specific purposes than some major gender differences are apparent between upland and lowland households. Both men and women use water for all purposes in most households in Mae Hae (Table 5). In Mae Kuang there is much more gender specific uses with men using water more for agricultural activities and tourism-related activities then women, whereas women were more frequent users for home businesses and home cleaning. [2] [3]

Table 5 Uses of water by men and women (% households in which the water source is used, no calculation for rare uses <10 occurences).

	Mae Kuang			Mae Hae		
Water uses	Men	Women	Both	Men	Women	Both
Paddy rice	32	11	58	5	2	93
Other field crops	40	9	51	2	2	96
Fruit orchards	37	11	52	2	2	96
Livestock	36	18	45	2	6	92
Home gardens	-	-	-	2	13	86
Tourism	48	8	45	-	-	-
Home business	18	29	53	1	3	95
Cleaning house	21	29	50	2	19	80

Risks and insecurities

[2] Q46 - some poor distinctions between sub-questions: e.g. 46.1 and 46.6

[3] Should expand discussion of this table using qualitative interview information

Shortages

In both Mae Kuang and Mae Hae, water shortages were most likely between March and May (Table 2). Very few houses were short between August and January. More households usually experienced water shortages in at least one month in Mae Hae (56%) than in Mae Kuang (22%)4.

In Mae Kuang duration of longest shortages experienced was as follows: less than or equal to a week (7%), between a week and a month (10%), more than a month (4%). Shortages were primarily experienced by those needing water for rice (14%). Shortages were much less frequently experienced for other agricultural activities, like field crops (2%), orchards (3%), livestock (2%), or aquaculture (1%). Non-agricultural uses rarely experienced shortages (all < 1%).

In Mae Hae duration of longest shortages experienced was as follows: less than or equal to a week (12%), between a week and a month (33%), more than a month (6%). Shortages were most common for crops (35%) followed by rice (26%). Shortages were much less frequently experienced for orchards (3%) and home gardens (0.3%),

Table 6. Percentage of households reporting water shortages as typical in each month.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mae Kuang	1	2	12	18	6	2	1	1	0	1	1	1
Mae Hae	2	6	30	38	23	12	7	2	1	1	1	2

In Mae Kuang households who have suffered shortages typically attribute them to low flows in the dry season (83%) and less frequently to consumption by others (23%) or changes to water delivery systems (33%). Likewise, in Mae Hae shortages are attributed to low flows in the dry season (53%) and less frequently to consumption by others (17%), changes to water delivery systems (2%) or reduced rainfall (2%).

We analyzed multivariate association between various candidate predictor variables and a household experiencing water shortages using binary logistic regression. Water shortage could be measured in two ways: by presence of activities for which water short and experiences of shortage by month. They yielded very similar results so we only report first.

Households having an agricultural production income were seven time as likely to experience water shortages than those which do not (odds ratio = 6.8, 95% CI 4.14-11.3). Once taken into account study area and low income were not significant predictors.

There was no evidence that indicators of gender relations within a household were associated with the likelihood of a household having experienced water shortages. Indicators tested included: women having bank accounts, a role in borrowing decisions, ownership of land. We adjusted for single-women headed households. Women and men reported similar levels of household water shortages.

Conflicts

[4] Note this based on Q56 (months) if ask in a different way (Q55) by activity fractions are slightly different (54 and 18%)

Altogether 7.5% of households in Mae Hae and 5.8% in Mae Kuang acknowledged having been in a conflict or dispute with other water users about the allocation, management or use of water. Three-quarters (72%) in Mae Hae and half (48%) were between water users located upstream-downstream from each other.

The impacts of conflicts differed between Mae Hae and Mae Kuang (Table 7) with higher impacts on relationships within households reported in Mae Hae. In no instances did respondents say women were more affected by conflicts than men; but in 30% of cases in Mae Hae and 4% in Mae Kuang men were said to have been more affected. According to both men and women respondents, men (21%) more frequently play an important role in conflict resolution than women (7%). Three households in Mae Hae and one in Mae Kuang reported threats of as a consequence of water related conflicts.

Table 7. Impacts of conflicts.

Impact of conflict on	Mae Hae	Mae Kuang
Relationships within households	30	4
Relationships with rest of community	25	35
Ability to grow food	11	13
Technology choices	30	4
Livelihoods	11	14
Water sources	11	0

Conflicts also occur because differences in how rights of access to land and water are interpreted. One way this can happen is after a household moves. Thus a household that now lived in a separate village believed they still had a right to land and water they enjoyed where they use to live. In one case one family fired shots near another's house as a threat. The village heads of Huay Kamin Nai and Huay Nam Chan met to settle the dispute without resorting to police, but appealing to local institutions. In this case the culprits had to go through a public ceremony ("Koh Karma") asking forgiveness by pouring water over the heads of the victims and wrapping their wrists together. The village heads also agreed and emphasized that if there was a recurrence they would report to the police.

Minor conflicts among water users of course may be settled directly by those involved. Village heads and water user committees, however, are often requested to come and help resolve conflicts in the dry season (March-May). Village headmen have an important role in water management. The instruments they use include the systems and laws of the Thai state, local institutions of water users and village-level customs important to resolving conflicts.

We analysed multivariate associations between candidate predictors of ever being in a household conflict over water in same ways as for shortages. The findings were similar.

Households having an agricultural production income were almost four time as likely to experience water conflicts than those which do not (odds ratio = 6.6, 95% CI 2.73-15.8). Households in Mae Hae were 2.3 times as likely (95 % CI 1.18-4.59) to have been involved in conflicts as those in Mae Kuang. Low income was not associated with risks of conflict.

As for shortages there was no evidence that indicators of gender relations within a household were associated with likelihood of a household experiencing water shortages. Indicators tested included: women having bank accounts, a role in borrowing decisions, ownership of land. We adjusted for single-women headed households.

Participation and institutional capacities

Water user groups

Overall 31% of households in Mae Kuang and 69% in Mae Hae belonged to a water user group. Men were more likely to be members than women in Mae Kuang a Khon Muang community, but in the uplands both men and women were often members (Table 8). Committee positions, however, in lowland and, even more so in upland, sites were dominated by men.

Table 8. Gender balance of household representation in water user groups and their committees.

	Mae Kuang	Mae Hae
Water User Group Member	(n=126)	(n=403)
Men	61	19
Both	17	78
Women	21	2
Water User Group Committee	(n=44)	(n=117)
Men	73	91
Both	18	2
Women	9	7

Both men and women respondents agree that when women participate in meetings about water management – which they only infrequently do (7.5% of households) – they are usually listened to (93%). But there was some variation among areas (or ethnicities): with upland households (96%) more likely to listen to women attendees than lowland ones (85%). The findings were independent of gender of respondents.

Watershed management organizations

Knowledge of and participation in larger-scale water management institutions, however, was more common in Mae Hae. In Mae Hae, more than half (57%) knew of the Mae Hae Watershed network. Of these 86% had been involved in their activities. In Mae Kuang, about a fifth (21%) of respondents said they knew of the Mae Kuang River Sub-basin Committee. Of these about two-thirds (62%) had been involved in some of the Committees activities.

Mae Kuang

David Thomas (Thomas 2005, 2006) documented the selection and early establishment of the Mae Kuang River Sub-basin Organization (RSBO) under the Upper Ping River Basin Organization. Initial proposal for membership of RSBO were modified following discussions (Table 9). Women's participation was 'secured' through representation in categories of "housewife" and "women's development" groups. Ganjanapan and Lebel (2009) followed-up during the politically unstable period between 2007-2009 where changes in governments caused multiple changes in RSBs and RSBOs committees with new rounds of selection and budget cuts. Under a new directive issued by Department of Water Resources the committee was reduced from 45 to 35 members. The Mae Kuang River Sub-basin Committee and most of RSBOs in Ping river basin were in the process of re- selection in late 2009 (Ganjanapan & Lebel 2009).

Overall participation has remained gender skewed. Despite women being involved in water use and management, participation of women within Mae Kuang sub-river basin is minimal and is at lowest (sub-district) level and not higher (district, provincial and sub-basin levels) in the working group hieararchies. One exception is that at Ping river basin level, there are a few educated women participating, for example, as part of the Upper Ping Watershed Management and Academics Sub-Committee (Ganjanapan & Lebel 2009).

Table 9. Final structure of the first Mae Kuang river sub-basin committee

Chairpersons and Secretaries	
Elected Locally	
Sub –Committes	
Linkages with Local sub-watershed committees	
Membership composition:	
Old existing community organizations	**6**
Community forestry networks	**3**
Stream conservation networks	**3**
Farmers networks	**3**
Ethnic minority groups	**3**
Housewives groups, Women's development groups	**3**
Local government (TAO, tessaban, PAO)	**6**
Kamnan/ Village headmen	**6**
Government officials, agency local units	**4**
Local specialists	**4**
Non-governmental organizations(NGO)	**2**
Private investor / entrepreneur groups	**2**
Total membership	**45**

Mae Hae

In 1999 the Mae Sa Nga Watershed Unit was established by the Forest Department to prevent village encroachment and recover degraded forests in the watershed as well as deal with various state agencies. The unit then formed the Mae Hae Network Committee (MHNC) to initiate forest protection activities. Representatives are drawn from each of the 15 villages in the watershed which are formally clustered into 7 "administrative" villages. The committee, financially supported by the Forest Department, meets each month. These forums provide space for village representatives to raise issues and explore shared interests. But the committee often finds that it lacks the necessary authority to resolve water and land-use related problems at both larger, watershed, and smaller, stream, levels. Moreover the Forest Department's objectives in conservation often clash with users interests in access to resources. Meetings of the committee are held at the office of the Royal Project in Mae Hae village. The Royal Project is both a water-user and a water manager and coordinates with state and development agencies. The Mae Hae committee has always been made up entirely of men.

Discussion

What are the main gender differences in the use and management of water? How are these differences perceived and explained in different cultures?

Women are major users of water for agriculture in the uplands, but less so in the lowlands. In the lowland, Muang, culture, irrigation is viewed as a masculine activity. In the uplands the role of women is more widely accepted and acknowledged; women are frequently part of water user groups.

Men, however, dominate 'decision-making' positions in both community-based and state-led water organizations in upland and lowland areas. Women's lack of representation and influence in upland organizations, in particular, does not reflect their acknowledge roles as farmers and irrigators.

Cultural norms with respect to roles and rights of women among Karen, Hmong and Muang are different and don't fit simple stereotypes or neatly match roles in water management. Women in lowland Muang households, for instance, are more likely to hold major assets like land or vehicles; but decisions to borrow money were much more likely to involve both men and women in upland Hmong and Karen households than in lowland Muang households.

There were many similarities but also some substantial differences in perception of men and women and among cultures with respect to whether certain argument and conflict-related behaviors were feminine or masculine characteristics. These observations have implications for facilitating negotiations or conflict resolution in multi-ethnic contexts. First they provide a counter-argument to simplistic assumptions that traits like masculine assertiveness are desirable in such situations (Thompson et al. 2010). In these communities, but with significant differences by ethnicity, behaviors typically thought of as masculine would tend to escalate conflicts and reduce cooperation. Second they imply a need to consider underlying cultural-differences when seeking to empower women in such complex settings. Men and women from and in different cultural contexts are working against a different background of assumptions about likely behavior.

How have water insecurities affected, and been influenced by, gender relations and ethnicity?

The design of this study allowed for relatively direct tests for interactions between gender relations and water insecurities, with a constraint that the settings did not include exceptionally severe shortages or violence-ridden conflict. In this "modest" context water insecurities at the household level are not strongly influenced by gender relations. Moreover, households where women control assets or finances, or have greater roles in decision-making, were not more or less likely to experience water shortages or be involved in conflicts.

How have women and men of different ethnicities and authorities tried to reduce insecurities, and with what consequences for the vulnerabilities of women and men?

Women are major users of water for agriculture in the uplands, less in the lowlands. Their formal roles in water management decision-making bodies do not reflect their actual roles and responsibilities. Cultural norms with respect to roles and rights of women among Karen, Hmong and lowland northern Thai, are different, again adding considerable complexity to efforts to improve gender balance in water governance. Meaningful participation in lowland communities, in particular, seems problematic given existing gender relations and attitudes towards water management responsibilities.

The government approach to water insecurities in the lowlands has been to build more water storage and delivery infrastructure, sometimes building over pre-existing communal irrigations schemes. In the uplands investments in infrastructure has been more limited and apart from some early reservoir construction focused on securing village domestic use water supplies from mountain streams. Most of the irrigation infrastructure apart from two reservoirs is private.

Conflicts and shortages impact on relationships within households and the community. It is not clear, overall, how the interventions by authorities at different levels have made women or men more or less vulnerable. Local institutions related to water management, both in lowland and upland settings, however, are clearly important for resolving the vast majority of local disputes.

Limitations, significance, what next

This study had several important limitations and points to a few important topics for further research.

Ethnicity was used here as proxy variable for culture. Despite being a crude proxy the findings of this study show that culture is important to the ways gender relations and water management are connected to each other. At the same time it is important not to put too much emphasis on ethnicity. First ethnicity is in part confounded by location with our simple design – all Muang households were in lowlands and all Karen and Hmong were in uplands. There are many other differences from living in these two settings apart from ethnic-related culture. Second, most households are now engaged in a market economy and culture is reshaping itself strongly with elements of both fusion and recreation. There is an important dynamic element which is missed by one-off classification of households, however, it is done. More direct measurement of norms and how they are changing and how they vary with place would provide much sharper understanding of interactions with gender relations as a producer of social difference. Finally, drawing too much attention to "ethnic-based" differences also carries with it some risks that it could reinforce prejudices of water managers and decision-makers.

Further work on gender relations and water insecurities should be carried out in locations with more persistent and serious conflicts. As move further downstream in the Mae Kuang river sub-basin this would mean engaging with water quality issues and larger-scale industries.

Conclusions

Gender relations are an important, but still relatively neglected dimension of efforts to expand stakeholder participation in water management. An improved understanding of bargaining and negotiating power, constraints on agency, and the alternative strategies open to women in increasingly 'participatory' water management initiatives remains fundamental to reducing water insecurities and social justice.

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Irrigation expansion in the Vietnamese Mekong Delta: Back to the future

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Abstract

Currently, Vietnam irrigation development policy directions are divided between the objective to continue increase rice production through agricultural intensification and to improve farmer's livelihoods through crop diversification and integrated farming. While the first objective requires the construction of new large-scale irrigation system in deeply flooded area, the latter demands the modification in management of existing irrigation physical infrastructure for non-rice crops, in particular brackish aquaculture in the coastal zones. This article attempts to fine tune this division. It argues that the Government of Vietnam's plan to expand irrigated areas in the Mekong River Delta, MRD) should be discussed beyond the conventional line of food security and poverty reduction argument. Using the evolution of Vietnam irrigation policy from the last three and half decades as its reference, the article highlights the potential of polycentric decision-making concept, focusing on the concept's ability to capture the multiple forces, interests and resources essential for the future irrigation development in the MRD.

Introduction

The Vietnamese Mekong River Delta, MRD) is the last region of the country through which the Mekong River reaches out into the South China Sea, called East Sea by Vietnamese). The delta has a total area of four million hectares for nearly 18 million of Vietnam inhabitants in 2006, about 22% of the whole population of the country). Compared with other Asian countries, Middle Asia, North-East Asia regions) annual average runoff volume per capita representing the water resource in the MRD is very high, at least four times that in other regions, and according to data recorded in 1990, this was about 35,000 m3/capita, Can, 2000). However, due to high seasonal variation with over 90% of rainfall and surface water are concentrated during the flood season from May to November, the great potential for agriculture and aquaculture production in the MRD is only exploited if flood is controlled and irrigation in the dry season is improved.

The Mekong Delta comprises a vast flood plain with an elevation of 0-4 m above mean sea level. It is formed of eroded sediments from the upper basin that are deposited in the lower basin, Fedra, 1991). The river network of the Mekong as it reaches the MRD consists of nine estuaries and a dense canal network. The River discharge at Tan Chau in the Tien river (Fig. 1) is 3-5 times larger than that at Chau Doc in the Hau River (Nguyen, 2006). The Vam Nao, connecting river 20 km downstream of Tan Chau and Chau Doc, conveys water from the Tien River to the Hau River, augmenting flow downstream of this point. There is an extensive network of canals that has been constructed in the last 300 years. The structures comprise 7,000 km of main canals, 4,000 km of secondary canals on-farm systems, and more than 20,000 km of protection dykes to prevent early floods, MARD, 2003).

Massive infrastructure development in the Mekong Delta highlights the area's importance for the country's agriculture development. Vietnam was still a net rice importing country in 1985, but it exported 1.4 million tons of rice in 1989 and 4.6 million tons in 1999. In 2000, agriculture occupied 85% of the total area of the MRD and contributed more than 50% of the staple food and 60% of the fish-shrimp production of Vietnam, Minh, 2000). Since that year, the Mekong Delta has contributed more than 90% of rice exported from Vietnam. This remarkable increase in rice production is related to the rapid growth of rice planted area in the past 20 years aided by the expansion and increased density of the irrigation and drainage system.

Traditionally the life of Vietnamese in the MRD is closely linked with water bodies as typical rice-water agriculture is practiced. This close link is evidenced from the creation of the River-Water Civilization, Van minh Song Nuoc), which represents population settlement along the river and canal levees. This River-Water Civilization is based on intensive water use, including domestic water supply, navigation, irrigation, aquaculture and fishing, and industrial use. Almost all of the delta people's activities and infrastructure are highly dependent on irrigation and drainage systems and very adaptable to the changes in water regime.

Historically, the delta was sparsely populated before large scale settlement by the Vietnamese began 300 years ago. The study by Biggs, 2004) of the hydraulic history in the delta discusses how the first canals were built from 1820. In the late 19th century to early 20th century, the French continued to construct a large-scale canal network, Cho Gao Canal, Xa No Canal) through dredging and settlement measures. In addition, many water control projects were constructed by central government from 1975 onwards. These include floodgates, saline protection dams and dykes, sluices, and pumping stations. Channel density is about 20 - 30 m/ha and the channel area occupies 9% of the delta area, An, 2002). The interlacing rivers and dredged canals have been connected together with a total length approaching 5,000 km in 1993, Ministry of Transportation, 1993). However, the canal network was expanded and improved rapidly for irrigation purpose, therefore in 2002 the total length was estimated approximately 7,000 km of which 4,430 km are principal and primary canals with a width of 8-40 m and a bottom elevation at -2.0 m to -4.0 m below mean sea level.

Based on the natural conditions, the MRD can be divided into three main water resource zones, Fig. 1). Boundary of flood and salinity at different levels are showed in Figure 3.

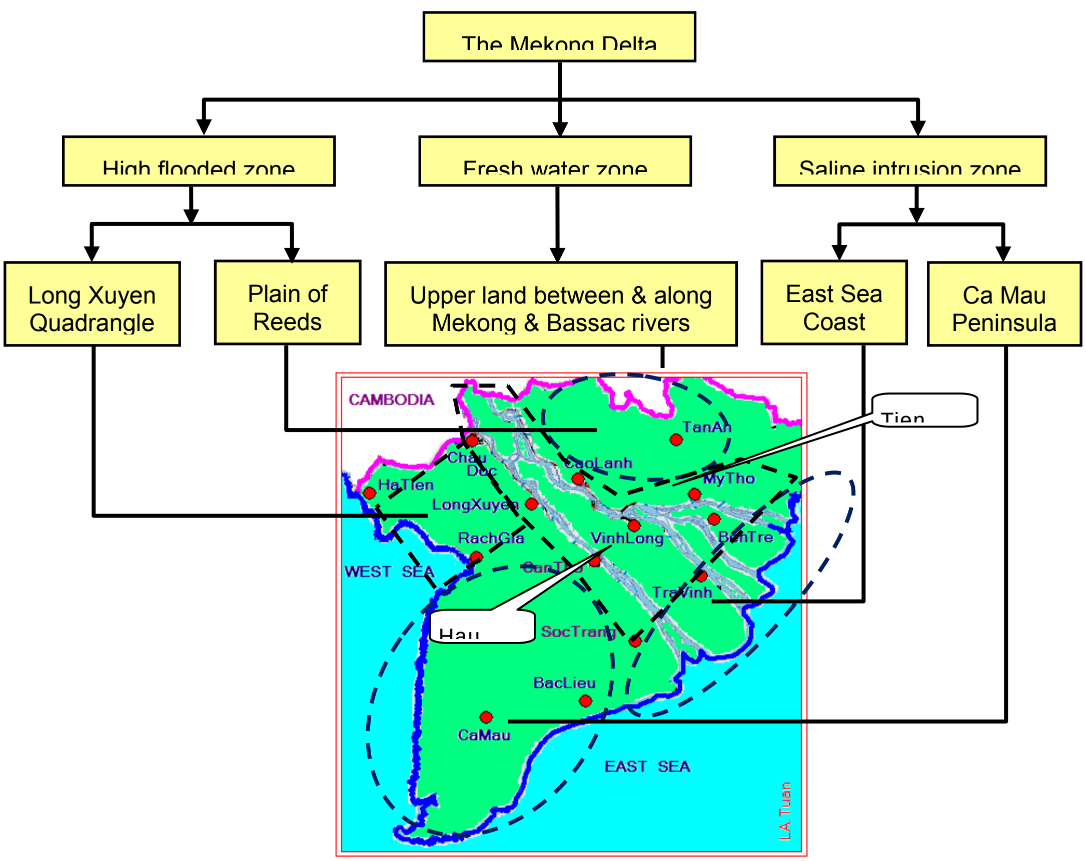


Figure 1: Three main water resource zones in the Mekong Delta

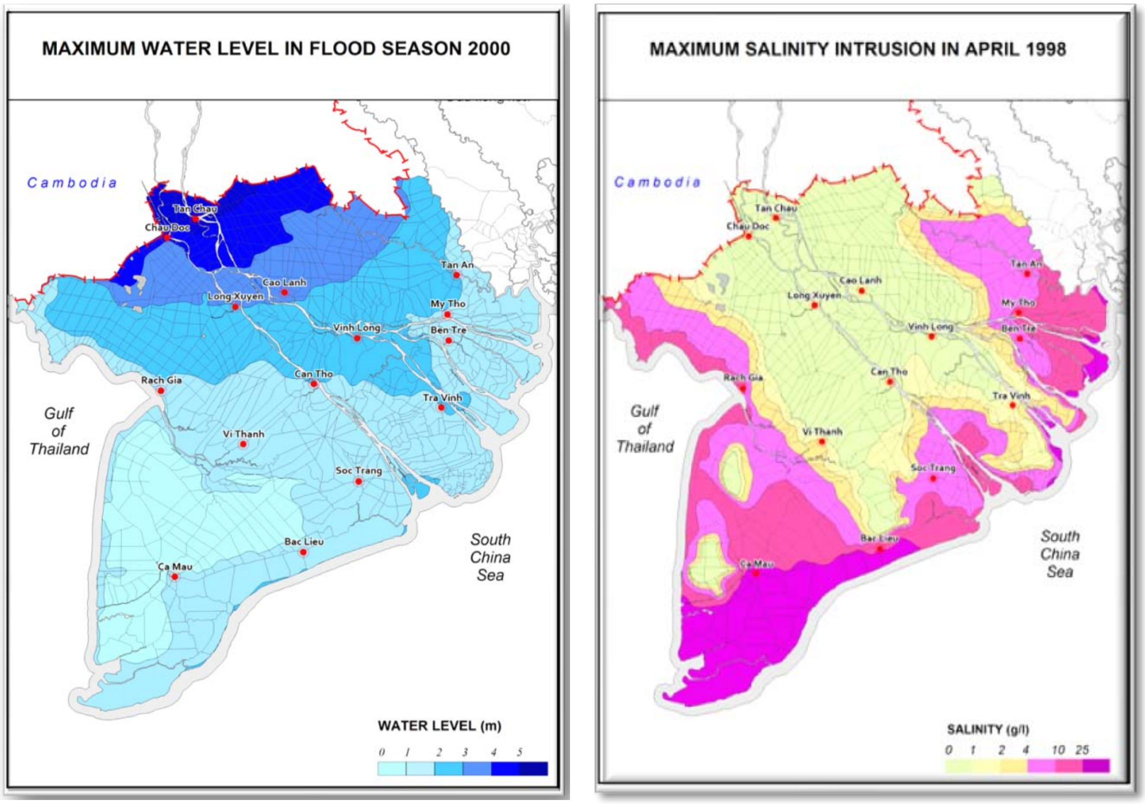


Figure 2: MRD Water Resource Extremes:, a. left) Maximum water level in flood season;, b. right) Maximum salinity intrusion, Truong and Ketelsen, 2009)

Each year, from July to December, a large part of the delta is inundated from both the overflow from the Mekong River and local rainfall, Fig. 2a). In the northern part of the MRD, approximately 200-250 km from the Mekong river mouths, the Long Xuyen Quadrangle, covering mostly An Giang province and a part of Kien Giang province) and the Plain of Reeds, Dong Thap and Long An provinces) mainly covered by acid sulphate soils, ASS) have poorly drained depression areas with inundation lasting up to 4-6 months. The reclamation of acid sulphate soils for agriculture pollutes water in canals and shallow ground water by acidic substances, aluminium, iron and other heavy metals.

Due to the policy of increasing rice production in the MRD, in last 30 years dry season rice crops expanded to 3.8 million ha, more than three times than dry season rice area in other Lower Mekong Basin countries combined) in the northern and central zones contributes to water shortage and induces more saline intrusion in the coastal zone. The saline affected area, Fig. 2b) expands throughout the Mekong Delta in two main coastal zones that constitute over a half of the total land of the delta:, i) the Eastern coastal zone running from Vam Co River through the Hau River, with an affected total area of 780,000 hectares; and, ii) the Ca Mau peninsula with 1.26 million hectares, CTU and DANIDA, 1996) where about one third is also covered by acid sulphate soils. In these coastal zones, rice and shrimp development causes conflicts over water requirements for rice crop and shrimp production.

Since the life of local people is mainly based on agriculture, irrigation development is the most important driver for improving livelihoods, in particular of the poor in the MRD. This article looks closely at the evolution of decision in MRD irrigation during the last three and half decades. Referring to this policy evolution, we will look back to the future how decision in irrigation should be made.

Brief history of irrigation development in the MRD before 1975

The acknowledgement of the MRD's high agricultural development potential has started as early as the 18th century. Major canal projects such as the Vinh Te Canal were excavated during 1820-1825. The fastest development was from 1860 to 1930 under the French colonial regime when many canals were excavated and cultivated area was enlarged rapidly. Biggs et al., 2009) also reported that under French colonial rule the aspiration to develop technical, large-scale irrigation system continued. From 1890 to 1930, more than 165 million cubic meters of earth were dredged and the total area put under cultivation rose fourfold to over two million hectares. Driven by the objective to raise the colony's production of rice, the first projects to build "Dutch dikes" and saltwater dams and irrigation canals for fresh water supply began under colonial rule in the 1930s. French colonial officials believed that the colony's rice production can be increased by resettling many thousands of poor tenants to the new lands and drew up massive plans to relocate farmers from the Red River Delta into the broad depressions such as the Long Xuyen Quadrangle and Plain of Reeds as well as the coastal region. Nevertheless, the war period, 1945-1975) was important for incubating new strategies of water use that often involved reverting to relying on local resource management, especially in resistance zones controlled by Vietnamese revolutionaries. The study as well as implementation of large irrigation projects under this period is restricted due to the war. The first irrigation development plan was prepared by HANSI, Serviced' Hydraulique Agricole et de Navigation du Sud IndoChine) that covered both the western part of Hau river and the Plain of Reeds. However, only limited projects for canal excavation and construction of sluices along the coast were included. From 1960 to 1972, many irrigation projects were studied, such as the My Phuoc project – 14,000 ha by SOGREAH in 1963, the Thanh Quoi project – 1,300 ha by US Army Corps of Engineers in 1968, the Go Cong project by Korea Government in 1971, the Plain of Reeds project by US Army Technical Corps of Engineers in 1971. Intermittently into the 1970s, Nippon Koei then fulfilled contracts to re-develop the construction works, and in 1972 actually completed construction of anti-salinity dikes and barriers in Tiep Nhut project, southeast of Soc Trang province. The Go Cong 'pioneer agricultural project', similarly focused on salinity intrusion control, was funded by the Asian Development Bank, ADB).

For the entire MRD, a water resources development plan studied by the Development and Resources Coorporation, D&R), US in 1968 by the request of the Mekong Delta Development Program comprised of a dike and water control system to increase the rice production in the MRD to 10 million tons by 1990. Irrigation development of both Cambodia and Vietnamese Mekong Delta was included in the Report on the Indicative Basin Plan-1970 by the Mekong River Committee with similar plan by D&R, Committee for the Coordination of Investigations of the Lower Mekong Basin, 1970). In 1974 the the Netherlands Delta Development Team completed a set of reports for agricultural development with improved water control in the Cambodia and Vietnamese Mekong Delta, but only provided recommendations by zone without concrete projects, The Netherlands Delta Development Team, 1974).

Irrigation development after 1975

Following the end of the War in 1975, the re-unified Vietnamese government immediately commenced a ‘rice everywhere’ campaign due to severe food shortages in the country and embarked upon a number of new reclamation projects in war-torn areas but with little overall effect on raising productivity. Saline water was in the state’s point of view a constraint to agriculture rather than a resource for aquaculture, as farmers view it today, and flood a threat and constraint to intensification. This ‘rice everywhere strategy’ was intensified following the severe flood of 1978, when floating rice crops were devastated, which served to justify investment in flood-protection dikes, canals and pumping stations. This strategy was further strengthened in the 1980s, as the country continued to experience food shortages, Hoanh et al, 2003). Such schemes to manage water across vast territories were first realized slowly, with mainly earthworks by hand and limited machinery and small sluices, and it was only after the “doi moi”, *reform* or renovation) period with market liberalization starting in 1986 that the government was financially able to invest in large-scale plans again. Since then, the MRD has become one of the most productive zones for rice and aquaculture in the world, supplying more than 70 and 50 per cent of Vietnam’s foreign export amounts of these staples. Since 1986, the Vietnamese government has tried to shift the cost of maintaining canals and other infrastructure away from the central government to provincial governments and private landowners as part of a broader strategy of, fiscal) decentralization. Such decisions have challenged sub-national and local authorities to find new cooperation models that can sustain and improve their systems. Secondly, in an attempt to widen the consideration of water resources management from the historical focus on irrigation development, control over the development of waterways and irrigation has shifted from the single domain of a Ministry of Agriculture and Rural Development, MARD) to shared responsibility with the Ministry of Natural Resources and the Environment, MONRE), Molle and Hoanh, 2009).

In this section the evolution of irrigation development policy in the MRD during the last 35 years is reviewed. Using the Vietnamese government reunification in 1975 as the starting point and based on the evolution of the policy view in agriculture and irrigation development, seven different policy periods are identified. The length of each period is not uniform as this depends mainly on the occurrence of policy change. The policy analysis looks at the main events and achievements during each period, as well as possible policy interconnection between two or more consecutive periods. In this way, present and future irrigation development policy in MRD is analyzed in relation to past policy decisions, rather than as a separate policy decision that stands on its own.

Formal process of decision in irrigation development

First, the Central Government and all Ministries prepare a long-term socio-economic development strategy for 10 years, including agriculture and irrigation, to submit to the National Assembly for approval. This strategy was based on a resolution prepared by the Communist Party Committee and approved by National Party Congress. Before 1990, Vietnam did not set up a complete Strategy on socio – economic development. During the war, the Party determined two strategic tasks as to build socialism in the North of Vietnam and to fight for unification of the country. After the war, two main strategic tasks are to build socialism and to protect the nation. Based on the socialist revolution process, socio-economic development strategy, and science and technological development strategy were built during the transitional period. So far, Vietnam has prepared development strategy for 2 periods, the “10 Year Strategy for Socio-economic Stabilization and Development during 1991-2000” prepared in 1990 and the “10-Year Strategy for Socio-economic Development during 2001-2010” prepared in 2001. The second strategy is to accelerate the industrialization and modernization following the socialism direction so that Vietnam becomes an industrial country by 2020.

Because planning is a key characteristic of centralized communist economies Government of Vietnam formulated their 10 year integrated socio-economic development plan based on the approved development strategy, then a 5 year development plan with detailed programs and projects, and development guidelines for all regions and sectors. The First Five-Year Plan 1960-1965 was only applied to North Vietnam during the war. The Second Five-Year Plan was implemented in 1976-1980 after the country reunification. For irrigation, the Institute for Water Resources Planning, IWRP) and the Southern Institute for Water Resources Planning, SIWRP) of MARD are in charge of preparing the irrigation development plan in corporation with other sector planning institutes such as agriculture, aquaculture, construction, transportation, energy.

The approved development plan then is put under implementation phase by formulating a number of irrigation projects for feasibility studies implemented by various institutions such as water resources planning institutes, water resources research institutes, hydraulic design institutes, later became companies), water resources university. When these feasibility studies are approved, an irrigation design study is carried out to provide the requirements of hydraulic works to contracting companies as the Dredging Companies and Hydraulic Works Management and Operation Companies under MARD, or Construction Companies in other Ministries.

While all irrigation plans and most of feasibility and design studies are done by the Central Government institutes or companies, the construction, and thus decision in investment) and management of irrigation systems are allocated to different management levels with some overlapping in responsibilities. Principal and primary canals are under responsibility of Central Government. Primary and secondary canals, Fig. 3) are under responsibility of provincial authorities. District authorities are responsible for secondary and tertiary canals, and communes are responsible for tertiary and on-farm systems. There are some overlapping in responsibility on primary canals between central and provincial, secondary canals between provincial and district, and on tertiary canals between district and communes. This overlapping is to ensure interaction and integration between authorities at different administrative levels. Official participatory irrigation management, PIM) and irrigation management transfer, IMT) to direct water users as Water Sharing Groups, WSGs - “to duong nuoc” in Vietnamese) and farmers have also started, but the effects are still limited. The informal management system, such as oral agreement among actors, farmers, WSGs and companies) are still more common, but not documented.

Under the management system in Vietnam, participation in decision is requested, therefore group decision is dominant. However, this group decision approach leads to a problem in management because no individual wants to be responsible when decision is wrong, or considered as wrong by the others). Therefore even in reality certain person, as Chairman or Director) is the real decision maker, a group meeting for making a decision is always requested, and the final decision was officially assigned to the group with a minute of the meeting. Document on decision made by individual is not usually prepared, and if exists, it is not publicized. Only in few special cases, as for the late Prime Minister Vo Van Kiet, decision on water resources development in the MRD was publicized.

During the strong centralized period, before *reform* in 1986), the decision process was top-down, from Central Government to lower levels, and decision was made by supply side, water resources ministry) rather than demand side, agriculture and other water use sectors). After *reform*, under the new market oriented economy, demand side and local management authorities have started to play more important roles in decision process. However, the main actors are still agencies that control the funding source or irrigation project budget.

Figure 3: A typical canal network with settlements along canal bank in the Mekong River Delta

(Imagery@2009 DigitalGlobe, Cnes/Spot Image, GeoEys from Google Wikimapia)

The evolution of decision in irrigation development in MRD

What is left for irrigation in 1975

As mentioned above, during the French colony period until 1954, because uncultivated land was still large and population density was low, irrigation was mainly combined to the development of canal systems for navigation and resettlements to expand into the new fallow regions. Therefore decision on irrigation during this period was not clearly documented. The expansion of canal system was decided by the French agencies. Improvement of irrigation system was implemented in the small scale where settlements were setting up and farming was implemented., Kham, 2008).

During the Vietnam war, due to the need of rice production for South Vietnam, decision on large irrigation projects were made by the Government as planned by the General Department of Irrigation, Ministry of Public Works. However, due to the war, irrigation development was centralized but only limited number of small projects could be implemented.. Decision were mainly done at the central government levels, based on the agreements between Ministry of Public Works and other Ministries such as Ministry of Agriculture, Ministry of Defense… Provincial authorities and community had very little role in decision, but mainly in implementing the projects in cooperation with state and private companies in dredging and construction of irrigation systems. However, the real decision was not only by the General Department of Irrigation at central Government and Inter-provincial Irrigation Departments in the Mekong Delta, but also the military who was controlling the security. Donors were also playing important role in deciding the size of the projects, e.g. ADB in the Tan An and Go Cong projects, the Japan Government in the Tiep Nhat project, D&R, 1968: in Kham, 2008).

Decision on irrigation in the Mekong Delta after 1975

1975: Irrigation development without plan – political decision

In the aftermath of the Vietnam War in May 1975, government at all levels was busy with the rearrangement of the state's management system and the preparation for the reunification process. During this transition period, power vacuum occurred in all development sectors. Irrigation development plan in the MRD prepared during the war was considered no longer suitable for the new situation and new management structure. At the same time, the government did not have any ready-formulated plan to replace the old one. In this context, irrigation development activities were proposed primarily to occupy and control the labor force that existed in the communities, 'public service labour' contributions - lao dong cong ich). Small canals were dug by hand in every province without planning and design. Later such unplanned development led to several problems, in particular in the areas of acid sulphate soils where disturbing surface soils caused serious pollution of acidity into canal systems and spread over the fresh water zones at the beginning of rainy season.[1] Water resources, "thuy loi" in Vietnamese) was called water disaster, "thuy hai" in Vietnamese).

1976-1977: Bringing experiences from Red River Delta to the Mekong River Delta

[1] Such way of using labour force was phased out in favour of charging a fee and replacing manual dredging with the hire of mechanical dredgers.

Four months after the re-unification of the country, established to study the water resources development plan, mainly focusing on irrigation for rice. From the agriculture policy point of view, Vietnam is represented by two rice bowls at two ends connected by a bamboo stick. One rice bowl is the Red River Delta, RRD), and the other is the MRD. The MRD was expected to be a much bigger rice bowl than the RRD due to its fertile soil and larger arable area. Therefore while the new water resources development direction for 1976-1980 was still under study by a Water Resources Planning Team for the Mekong Delta of the Ministry of Water Resources a decision was made to bring experiences from the RRD to the MRD.

The Water Resources Planning Team produced its first report on irrigation development entitled: “Direction for Water Resources Planning for Mekong Delta in 1977-1978”. This report was used as basic reference for the Water Resources Development Plan in 1976-1980. The plan proposed to increase rice production in the MRD through the introduction of large pumping stations and large canal system following the irrigation development model from the RRD. In practice, these large pumping stations with capacity of few hundred m3/hour, Russian type produced by factories in the North) for service area of 1,000 ha are not suitable to the MRD where pumping lift is low, 1-3 m compared to 5-10 m in the RRD). Not to mention that soil property in the MRD with high clay contents causes cracks and leaching of water in above-ground canals after a short distance of some ten meters. Moreover, unlike in the RRD, in the MRD, most farmers preferred to pump their irrigation water independently, using their portable low-lift pumps rather than depending on large pumping station. These small pumps were based on a 4-12 horse-power Japanese engine purchased before 1975 for dual purposes: irrigation and navigation, “shrimp-tail boat”). However, these small pumps were considered as a individual productiong equipment of capitalism to tight farmers with their market, engine, spart parts...) and did not support the large cooperative approach therefore they should be replaced by the large Russian pumping stations. Farmers were requested to contribute the pumps into cooperative properties, and operation of individual pumps were limited by gasoline control or other administrative measures. The use of these low-lift pumps were recovered later by the take off in pumps as a results of the liberalization of trade restrictions in Vietnam and the support given by the Chinese government to promoting exports of cheap pump sets to many areas in various countries, including the RRD. In turn, at the end of this period many large pumping stations were abandoned, while others still operating had very low efficiency with each station only used to irrigate few farms near the station., Therefore in the irrigation in the next period, these low efficiency pumping stations were not included.

At the same time, several WSGs continued to use the small irrigation systems with canals at ground surface and low-lift pumps efficiently, and taking advantage of high water level at high tide. So in fact, the farming community continued to play an important role in irrigation management at the farm level, despite the government’s top-down decision. These WSGs naturally developed in the community due to the needs of water sharing and the traditional culture of people living in the MRD without much intervention by external actors.

1978-1980: Political will at any price without impact assessment

The damage of rice crop due to severe flood in the MRD in 1978 caused serious shortage of rice in the country, and thus strongly politicized government’s decision on irrigation development at that time. The concept of achievement by political will under centralized decision system applied during the war was applied in irrigation development when the government decided that the defined development objective that is to increase rice production in the MRD should be achieved at any price without attention to social, economic and environmental impacts. Due to the shortage of rice in the whole country, the Government requested each province should provide as much as possible. This policy led to an administrative measure: blocking the market by prohibiting transport of rice and other basic food as meat from this province to another province, with a hypothesis that local people would provide more rice and agricultural products for subsistence when they could not find in the market. The model of cooperatives in the RRD was also applied to support the objective of increasing rice production.

In the irrigation sector, effort to increase rice production was done through the expansion of rice planted area with higher yield dry season crops, the summer-autumn from May to August before the flood and the winter-spring from November/December to February. This expansion was done primarily with expansion of irrigation system and the support from local authorities and farmers. Thank to the abundant radiation, leaching effect of flood water and fertility from flood sediment, rice yield of the winter-spring crop, 4-6 tons/ha) is much higher than that of main rainy season crop, 1.5-2.5 tons/ha). The main constraint in promoting dry season rice crops was water, as it was not always available at the rice field during this crop season. Irrigation became the key determining factor in government's policy focus on dry season crops. Yet, ensuring irrigation water provision to the expanded area for dry season crops is not without any constraint. Lack of dredging equipment, petrol and capital were among the constraints reported by the Minister of Water Resources. Nevertheless, driven primarily by political considerations at national level, a top leader insisted that the expansion should proceed by organizing large public fields for digging canals by hand, and that the government would print more money bills as to address the lack of capital. Another leader thought that farmers in the MRD, forced into the same model of cooperatives in the RRD, would support Government policy in increasing of rice crops when irrigation water was available, Kham, 2008).

Obviously, decision in irrigation in this period was still made by the top leaders at Central Government and was not based on the results of engineering, socio-economic and environment studies. The Ministry of Water Resources, provincial and local authorities had to focus all their efforts to follow such decision under several constraints as mentioned above. Other actors were only playing minor roles. Decision in irrigation development were also focusing on the poor and remote areas with low population under the control of the National Liberation Front during the war, but most of these areas are with poor soils, flooded or intruded by saline water, and under developed due to the lack of capital for infrastructures and appropriate management knowledge.

1981-1985: more studies needed before making decision

The failure to expand expected dry season crops made the Government realized that decision based only on political will without scientific back-up does not work, Ninh, 2003; Dieu, 2006). This realization was evidenced from the formulation and implementation of State Program 60-02 and 60B focusing on biophysical, socio-economic survey in the MRD and State Program 06-03 for integrated water resources management in the MRD. Updated data and analysis results from these state programs provided background information to revise the irrigation development plan. Furthermore, from 1981 to 1985, the line Ministries also expanded topographic and hydrological surveys into the areas where accessibility was limited during the war to strengthen their planning database. An elevation point map at scale 1:25,000 was established, cross-sections of main rivers and canals were updated and a network of over 100 hydrological stations were built to monitor water level, flow, salinity, acidity and other water quality parameters. With updated topographic and hydrological data, hydraulic and salinity models were also developed and regularly refined to simulate better the water conditions under different construction and management alternatives.

Under the new development plan, the MRD was divided into 5 large water development zones, namely Long Xuyen Quadrangle, West Hau River, East Tien River, Transitional Zone between Tien and Hau Rivers, and Ca Mau Peninsula. Water resources plan was revised in details by planning teams in charge of each zone. A delta-wide water resources development plan for 1986-1990 was formulated with the main objective to increase rice production to 9-10 million tons in 1990, as planned by D&R) and 15-16 million tons by 2000. At a smaller management scale, the MRD was divided into 120 water sectors, and irrigation projects were formulated for each or a group of sectors connected by main rivers or canals. Provincial irrigation development plans were also prepared by provincial authorities with the assistance of national planning institutes.

Based on these plans, irrigation development was implemented in different parts of the MRD:

- In the Northern part where the land is deeply flooded, covered by acid sulphate soils and fresh water source are limited in the dry season, a main canal network was excavated from the Tien river to the Vam Co rivers, from the Tien river to the Hau river, and from the Hau river to the Gulf of Thailand to irrigation for the winter-spring rice crop in the low flow season. A low dike system would allow protection from the August flood, lower than the flood peak that usually occurs in September or October) and harvesting of the summer-autumn rice crop. After this rice crop was harvested, flood water is allowed to flow into fields for trapping fertile sediment and leaching out pollution.
- In the Central part of the Delta where the land is moderately flooded but fresh water is abundant, existing canal network was improved with denser secondary canals, and dike for full flood protection was built so that rice crops can be cultivated through out the year.
- In the Southern part where the land is intruded by saline water and fresh water source is limited, dike and sluices for salinity control were built and canal network was improved to cultivate two rice crops in a year instead of only one rainfed rice crop.

Although the water resources plan completed in 1985 had not taken into account the all development factors under the *reform* policy, in particular the environmental impacts in flooded and saline areas, these irrigation measures helped the farmers in the MRD to increase rice production from 4.7 million tons in 1975 to 7.0 million tons in 1985 and later to 9.0 million tons in 1990.

During this period, the decision was not only based on political will of top leaders at Central Government anymore, but based on results from scientific studies implemented by scientists and researchers at universities and at research and planning institutes. Possible environmental impacts and effects on livelihoods of local people in irrigation development became part of policy consideration. At the same time, this new policy approach with focusing on scientific studies created more room for policy discussion. Such discussion was most apparent in the excavation plan of new canals, like the Hong Ngu canal) in the Plain of Reeds, Kham, 2008). The excavation of new canals in that zone received strong objection from both national scientists at various universities and research institutes as well as international scienties who studied the reclamation of acid sulphate soils in other countries around the world. They argued that these new canals would drain out acid water into the

Mekong River and cause pollution to the rice areas. At the same time, the voice of Provincial People Committees was stronger in the decision of irrigation development. This was evidenced from the strong request of stopping the excavation of Hong Ngu canal by the Chairman of Dong Thap Province during the visit of Minister of Water Resources to his province. Referring to the analysis provided by his scientific group that were contradictory with the opinion of scientists and planners of the Ministry, the Chairman thought that this new canal will lower the groundwater table and lead to more severe acid water situation. Only after a long discussion, the Minister could convince the Chairman to allow the excavation of this canal to be continued.2

However, since government control of market chains remained strong, rice production did not increase as fast as expected because no motivation for farmers to invest into farming, although water for irrigation was provided for growing 2-3 rice crops per year. At the end of this period the country leaders understood that the model of cooperatives from the RRD to convert all farm production resources such as land, machine, labor force… to common cooperative properties could not be applied in the MRD because of differences in natural resources, socio-economic conditions and culture. Therefore during this period the decision at farm level by farmers and WSG continued to be the most important in irrigation, although large scale irrigation systems were built or strengthened by Government, for examples the Tan Thanh-Lo Gach, Hong Ngu, Dong Tien, An Phong-My Hoa, Nguyen Van Tiep in the Plain of Reeds, the Tri Ton, Ba The, Muoi Chau Phu, Rach Gia-Ha Tien in the Long Xuyen quadrangle, the KH1, KH3, KH5, O Mon, Cai San, KH7, KH8 in the west Bassac.

1986-1995: Irrigation reform

The shift made by the government of Vietnam from centralized economy controlled and subsidized by the Government to “socialism-oriented” market economy, under *doi moi*) which allows competition in supplying and consuming of products had a great effect in the country’s production systems, and also in irrigation. Driven by the economic benefit they could get from their farming practices, farmers and WSG started to use the irrigation systems at full capacity for cultivation. Table 1 hereunder shows how farmer’s decision to change their cropping systems and increase irrigation water use has resulted in expansion of irrigated farming area as well as increase in rice production. Area of double and triple rice, either supplementary irrigated at the beginning of rainy season or fully irrigated during dry season, were expanded from 619,000 ha in 1985 to 1,023,000 ha in 1990 and 1,163,000 ha in 1995. At the same time, area of one rainfed rice decreased from 1,355,000 ha to 891,000 ha and 674,000 ha. The rate of conversion from one rice to irrigated double/triple rice during 1985-1990 was about 2 times of the rate during 1976-1980. With irrigated rice in the dry season, average rice yield increased from 3.0 tons/ha in 1985 to 3.7 tons/ha in 1995 and 4.0 tons/ha in 1995. However the

[2] After this canal was linked to the West Vaico River, acid water was pushed into this river by a strong flow from the Mekong River, then the water quality in the acid sulphate soil areas was improved and suitable for rice cultivation. Based on this result, many other canals through the acid soil areas in the Plain of Reeds and the Long Xuyen Quadrangle were excavated. It is difficult to conclude that such decision of canal excavation was really based on scientific analysis or on the perception of playing with risk by trial and error experiment in the real world that could be only accepted in the management system of Vietnam.

increase in rice yield under market economy also caused difficulty to farmers in making decision of investment into farm irrigation and changing cropping systems because of market price fluctuations with product supply and demand, and the lack of facilities for post-harvest processing and storage[3]. The Government understood that not only irrigation or agriculture, but harmonizing of development plans of all sectors are essential.

Table 1: Rice production in 1980-2005

Item	Unit	1980	1985	1990	1995	2000	2005
Agricultural land	1.000 ha		2,442	2,463	2,498	2,970	
Of which: 3 crops/year	1.000 ha		4	97	148	359	
2 crops/year	1.000 ha		615	926	1,015	1,334	
1 crop/year	1.000 ha		1,355	891	674	292	
Total planted rice area	1.000 ha	2,263	2,346	2,547	3,121	3,946	3,826
Rice yield	ton/ha	2.26	3.01	3.71	4.02	4.23	5.04
Rice production	1,000 tons	5,114	7,061	9,449	12,546	16,702	19,299

Source: SIWRP, 2005 and General Statistics Office, 2007.

These changes indicated a fact that the real actors in the irrigation decision were farmers who decided to change their cropping systems, and thus to increase irrigation water use. However, the irrigation planners and other actors claimed that their decision in improvement of canal system during the preceding 10 years was the precondition for farmers' decision. No matter who were real decision makers, irrigation development was paid more attention by not only by the Central Government, but by other actors as provincial, district, commune officers and water managers, farmers and WSG, because irrigation water became a condition for improving the production and their livelihoods.

Under the reform, from 1987 the policy in water resources development in the MRD was also changed: not only focus on irrigation for agriculture but also on integrated water resources management, IWRM) for all economic sectors, including navigation and transport, flood control, rural development, domestic and industrial water supply. By the end of 1980's the fresh water area along the main rivers in the central MRD has been developed with double/triple rice and other high value crops as vegetable and fruit trees at a speed faster than in the flooded and salinity intrusion areas at upstream and downstream. The Government then decided to focus water resources development on three large zones where water control was still limited: the Long Xuyen Quadrangle, the Plain of Reeds and the Ca Mau Peninsula. The irrigation system during this period was evaluated by irrigation planners as an open system with several advantages: easy intake of irrigation water and drainage of

[3] During the first few years after rice production increase, harvested paddy was stored in many schools and commune offices because farmhouses were full, and sometimes rice bags were used as gift at the wedding ceremony.

excess water, being used as navigation route, maintaining free migration of fish species, not require high skill in operation and maintenance but a major disadvantage of this system was the difficulty in control water flow, water quality, including salinity intrusion and pollution.

Donors returned to the MRD to support the construction of irrigation system in small projects few thousand hectares, such as the Tam Phuong project of funded by Australian in 1985-1990. Although these projects are small, a budget of few millions US$ in 1985 was quite significant when annual GDP, PPP) per capita was still as low as US$ 492, compared with US$ 1,646 of Thailand in the same year, and with US$ 1,008 of Vietnam 10 year later in 1995 and US$ 2,792 in 2008). The most important contribution of donors to the decision in irrigation was at the beginning of 1990s when the Government also understood the limitation of Vietnamese capacity in planning for development under market-oriented economy. A project to prepare the Mekong Delta Master Plan funded by UNDP was implemented from 1990 to 1994 by World Bank and Mekong River Committee Secretariat. The NEDECO, a Dutch consultant group, was selected to carry out this study, with the coordination of the National Planning Committee and contribution of line Ministries such as Water Resources, Agriculture and Food Industry, Forestry, Fisheries, Health, Transport, Construction, Energy, Sciences and Technologies, and 11 provinces in the MRD.

For irrigation, the Master Plan proposed:

- Adjust production systems and crop calendar so that irrigation demand at the lowest low flow period will not increase and salinity intrusion is maintained as during 1990-1994.
- Expand the salinity control projects such as the South Mang Thit, the Quan Lo Phung Hiep, and the West Vam Co to irrigate for 2-3 rice crops in a year in the coastal zone.
- Strengthen the dike for protection from August flood in the Northern part of the MRD, and intake flood water at the peak of flood to avoid from increasing flood level in Cambodia.
- Strengthen the dike for protection from annual peak flood for the central parts where fruit tree and 3 annual crops are cultivated.

Under this Master Plan, there large Improvement of Water Resources Infrastructure projects were proposed for funding by World Bank with total investment funds of USD 128.4 million in which the IDA loan is SDR 72.8 million, equivalent to USD 101.8 million according to exchange rate at the signing date of Loan Agreement): the O Mon Xa No, 45,430 ha) in fresh water zone, the South Mang Thit, 225,680 ha, covering the Tam Phuong project mentioned in Box 1) and the Quan Lo Phung Hiep, 178,888 ha) in saline water zone, location in Figure 4).

These projects fit well the decision of the Government to expand the irrigated rice into the flooded and salinity intrusion areas. However, in these areas population density was still low, infrastructures and facilities were poor. Therefore together with improvement of irrigation by strengthening or excavating of canals, new settlements, road, electricity and public infrastructures as school, market, hospital, etc were also built along the canals. Such development reflected a change in the basic concept of development: decision based on political will of top leaders does not work if it is not supported by actors at lower levels and affected people. Such sharing of decision power in irrigation was also reflected by the allocation of responsibility on different canal levels: principla and primary canals by Central Government, secondary canals by provincial, tertiary canals by provincial and district, and on-farm by commune, WSG and farmers. Nevertheless, planning and budget management was still centralized at Central Government with a requirement of increased rice production every year to each province. A target of every province during this period was to join the club of 1 million tons of rice as encourage by the Government. On the other hand, construction works were allocated to companies at different management levels depending on canal levels. O&M were still based on irrigation fee and subsidy, but the operation agencies were converted to state-owned companies.

1995-2000: The need for, and effect of, a strong leadership

In principle Ministry of Water Resources was responsible for all water resources development in the country, in practice hydropower was under the Ministry of Industry, domestic water supply was under the Ministry of Construction and navigation was under the Ministry of Transport. Therefore for improving the coordination between irrigation and agriculture in rural areas, in October 1995 the Ministry of Water Resources was combined with the Ministry of Agriculture-Food Industry and Ministry of Forestry to formulate the Ministry of Agriculture and Rural Development, MARD).

Until 1995, irrigation system in the fresh water and saline water has been basically developed or under construction, see example in Box 2: Quan Lo Phung Hiep project). However, severe flood damages in the deeply flooded area occurred in 1991, 1994, 1996 and 2000. The reason why flood control in deeply flooded area was not considered in the previous period because:

Flood control will affect the flood depth in Cambodia, and the costs of alternatives for minimize increase of flood depth in Cambodia are too high for considering in the preceding period when Vietnam economy was not developed yet.

- There was a strong objection by many scientists and local leaders to the full flood control plan prepared by water resources planner with the following arguments:

flood water with sediment contributed fertility to the rice fields as a significant source of nutrient for the soil where farmers were still poor and had only limited capital for fertilizer inputs, although the survey showed that in most areas, sediment precipitated quickly after a short distance from river or canal banks, and the more significant effect could be leaching effects and cleaning of toxic and crop diseases rather than sediment).

- Catching wild fishes in deeply flooded area provided a significant income to the poor.

flood control changed the flow regime and caused negative impacts on the environment, in particular acid water pollution would be serious when the canals were excavated in deeply flooded areas covered by severe acid sulphate soils in Plain of Reeds and Long Xuyen quadrangle., later experience in these areas showed that it took 3-5 years to leach out the acidity on the disturbed soils on the embankments of excavated canals so that people could settle along the canals to exploit the fallow land).

Box 1: The Tam Phuong project, location in Figure 4), Adopted from Australian Mekong Resource Centre, 2004).

The Tam Phuong project in Tra Vinh province reflect in practice the tension between the development objectives of equity and sustainability that was not taken into account when the decision of irrigation system was made. Tra Vinh is one of the poorest provinces in the MRC, with a high proportion of its population classified as poor. The project aims included: salinity intrusion control; acid sulphate soil control; drainage; and rice intensification. The project was constructed between 1985 and 1990, and covers an area of 7 000 hectares, reaching over 30 000 people.

According to gross measures of productivity the Tam Phuong water control project is regarded as a success by provincial and local officials. Rice production from the area has increased beyond projected levels, with the target production of 42 000 tons of rice exceeded by 6 000 tons in 1998. The local population, however, is faced with considerable challenges, including poor returns from rice, decline in environmental quality due to agro-chemical use, high cost of rice inputs, difficulties of water access and control, inequitable water access, and barriers to diversification. There are numerous costs associated with local water use, including: pumping costs, government irrigation fees and contributions, and private water-access fees. The primary cost is associated with water pumping, which is highly variable yet increases significantly for those without direct access to canals. There are also extra costs incurred by those who hire pumps, usually the poor and female headed households. Irrigation fees constituted a small but significant cost of production. Fees are set by provincial water resource authorities according to national guidelines. These fees form a crucial income source for provincial irrigation authorities since they have been reorganized as a state owned enterprise and seek to be financially autonomous of the central level.

Over the 15 years since completion of the Tam Phuong project, due to the low income base of the irrigation enterprise officials were faced with the disheartening prospect of overseeing the irrigation and water control scheme slowly degrade and fall apart before their eyes. Poor design, as well as neglect of the dynamic nature of local environmental conditions, flux of tides, seasons and silt laden water) contributed to the rapid siltation of canals and the failure of sluice gates. The local tertiary canal system is seriously inadequate in coverage and capacity, and results in problems of access for close to half of those interviewed. This results in people having to pump-through their neighbor’s fields. The Evaluation Report of the Tam Phuong project identified this poor design of the tertiary system, stating there was a “gross underestimate of the density of the [required] on-farm irrigation and drainage systems”, Asian Institute of Technology and Mekong Secretariat 1991:21).

Basic system maintenance is critical to ensuring water access is fair and equitable, as those with poor access or with land far from water sources are the first to suffer when systems begin to break down. The prioritization of funds for maintenance of existing irrigation systems by government at the central and provincial level remains seriously inadequate. Instead, whilst the existing system was woefully inadequate and inequitable in terms of water access, the government undertook to allocate central funds and borrow from the World Bank for a vastly expanded water control system for elsewhere in Tra Vinh and neighboring provinces, World Bank Mekong Delta Water Resources Project – South Mang Thit Component). There is a clear implication here for the way ODA is used to support poverty alleviation. The resolution of equity concerns, in terms of ensuring there is not an unfair burden of water access placed on the poor, needs to be considered in line with sustainable financial, operation and maintenance strategies. Such strategies need to be worked out by local authorities in partnership with local communities to find lasting solutions applicable to projects and the broader policy context.

In 2004-2005 the Japanese government supported the rehabilitation of the canals and canal gates of the local area of the Tam Phuong system. This reliance on aid to undertake basic maintenance and system upgrade undermines the potential of local authorities together with local communities to identify sustainable solutions to system maintenance. An implication of this long-term study for aid is that greater emphasis needs to be given to promoting internal financial sustainability within project operation to ensure project sustainability and equity.

Box 2: The Quan Lo Phung Hiep project, location in Figure 4)

The Quan Lo Phung Hiep region in the Ca Mau peninsula with a total area of approximately 450,000 hectares, is a target area of rice land expansion in the 1990s. The Region is a low-lying, flat delta with elevation less than 1.5 m. The two most important soil groups are the acid sulphate soils, 52% of the total area, mainly in western part) and the saline soils, 47%). Sandy and peaty soils only cover about 1% of the total area. During the dry season, the difference in tidal regimes drives flows from the South China Sea to the Guild of Thailand causes high salinity intrusion across the Region. During the early part of the rainy season, water pH in the canals drops from normal values, 6-7) to below 4 due to acid water flushed from acid sulphate soils. Salt water intrusion from the seas via four main rivers, the My Thanh, Ganh Hao, Cai Lon and Ong Doc makes water quality in most parts of the region unsuitable for irrigation from January to June. Therefore protection against salinity intrusion, especially through the My Thanh and Ganh Hao rivers, was identified as the key intervention for agricultural development. Based on the assessment on engineering feasibility, socio-economic benefits and environmental impacts of a study in 1989-1991, the option of construction of 12 large sluices along the national highway for protection against salt water intrusion and irrigation of the central part of 250,000 ha was selected.

The prefeasibility study by ESSA et al., 1992) proposed that the construction of 12 large sluices would be implemented in two or three phases with a sequence from east, Bac Lieu province) to west, Ca Mau province) and a delay of few years in between to check impacts of canal excavation and land use change on acid sulphate soils in the western part. However, while waiting for a loan from the World Bank Mekong Delta Water Resources Project – Quan Lo Phung Hiep Component), in 1993 the Government decided to build the project by national budget, and the construction of large sluices were implemented almost simultaneously to provide equal investment budget to both provinces. The construction of the first 3 large sluices in the east was completed in 1993, and effects on water conditions and subsequently on expansion of rice area have been observed since 1994. In 1996, the double rice area was up to 82,000 ha. Only in 1997 when 7 sluices were built, the Feasibility Study for Update Environmental Impact Assessment and Environmental Action Plan were reviewed, SIWRP, 1997 and Haskoning, 1998) to decide the implementation of the World Bank project, and a project appraisal document was prepared in 1999. Until 2000, when 11 sluices have been built and the secondary canals in the acid sulphate soil area have been excavated, the total area of double and triple rice and upland crops was up to 101,000 ha, 35% of target protected area), but mainly in non acid soils in the western part.

In areas with acid sulphate soils from the mid-1990s onwards shrimp growers, attracted by the high profits - 2 to 10 times of rice cultivation - of producing tiger shrimp, *Penaeus monodon*) for export, switched to stocking tiger shrimp post-larvae, and pond shrimp culture became popular, Brennan et al., 2000). The area of shrimp culture increased from about 10,000 ha in 1990 to over 30,000 ha in 1996, SIWRP, 2003). As the sluices in the western fringe of the study area became operational after 1998, thereby advancing the salinity-protected area westward, the supply of brackish water required for shrimp production was cut off, many farmers were forced to abandon aquaculture and to convert to less profitable rice farming. Conflicts between agriculture and aquaculture due to water control with a peak in 2001 when shrimp growers broke a sluice to intake saline water into the protected area prompted the Government to re-examine the original policy emphasizing rice production and to explore alternative land use plan and sluice operation that would accommodate shrimp cultivation in the western part while maintaining the areas of intensive rice production in the eastern part. A significant expansion of shrimp cultivation area were observed with 51,000 ha in 2001 and 64,000 ha in 2002.

While the water control system for irrigation has been not completed, and land use has been changed back to brackish water aquaculture, the Tact Thu large sluice with a shiplock with a cost of about 5 million US$ was decided in 1997 to be built in the Ong Doc river at the western border of the protected area by a loan, also from World Bank, for improvement of navigation separated from the World Bank Mekong Delta Water Resource Project. Therefore after its construction from 2001 to 2007 this sluice has not been operated for its main purpose of salinity control because of change in policy that allows brackish water aquaculture rather than only targeting to fresh water agriculture in the region.

Therefore a concept developed during preceding periods was “living with flood” that encouraged local people living on water or running to higher elevation places as canal banks during 4-5 months of flood season, from August to November or December. However, with denser population, higher cost infrastructure and larger rice crop area under improved economy and livelihoods, this concept was questioned and revised. Flood control, in combination with irrigation, transportation and settlement was decided as the main target of water resources development. The objectives of flood control were:

- Protect from flood for urban areas, rural settlements and main transport routes in the flooded areas.
- Reduce water level at the beginning and the end of flood season for the safety of two rice crops, the Summer-Autumn and the Winter-Spring by improving drainage to the Guild of Thailand and West Vaico River.
- Reduce water depth at the flood peak period to lower the costs of infrastructure but does not cause significant increase of water level in Cambodia.
- Improve soil properties, in particular in severe acid sulphate soils for expansion of cultivation area into fallow land.
- Improve living conditions for rural people.
- Protect the country boundary by two layers of canals and highways, one highway N1 along a canal at the border between Cambodia and Vietnam and the other N2 along a canal at a distance of 20-30 km.

Because there were many concerns about impacts of flood control in the past, such combination of flood control with other development purposes might not be decided if there was not a strong leader, the late Prime Minister Vo Van Kiet, who spearheaded Vietnam's "economic miracle" of the 1990s. With the position of Prime Minister from 1992 to 1997, he was one of the leading figures to bring about the *reform* that transformed Vietnam from a socialist system to one of the world's fastest-growing market economies. He decided to implement many important projects in the country during his term such as the North-South 500 kV power line, the Ho Chi Minh Highway, the Dung Quat Oil Refinery. He is also praised as a leader who was willing to listen the advise from scientists in making decision.

In the MRD his name is associated with the Decision 99/TTg 9/2/1996 on “Long-term direction and 5 year plan 1996-2000 for irrigation, transport and rural development in the MRD”, Khai, 2008). This case is quite different to the traditional culture in Vietnamese management where the decision is always attached to a group as mentioned above, and reflects his strong leadership. With this Decision, from 1996 to 2000 the total investment for development in the MRD was estimated 15,500 billion VND or 9% of GDP, equivalent to 1.4 billion US$, with exchange rate US$ 1 = VND 11,000 in 1996) of which Government invests 46% and people in the MRD contribute 54%. Flood control was paid much attention in this investment decision because of the above mentioned contradictory opinions. To support to this decision while there are different opinions among scientists of various Ministries and universities, a special team of scientists was formulated to study water control alternatives for the MRD. The team was headed by Professor Academician Nguyen Van Hieu, who is a well-known specialist in neutrino physics, but was Chairman of the Vietnam Institute for Sciences and Technology. Although Prof. Hieu is neither a water resources planner nor a rural development expert, his leading position helped P.M. Kiet to bring scientists of different institutes and universities, and water resources planners to a compromise alternative that is not too extreme in terms of full protection, but also not continuing the simple “living with flood” under natural conditions and partial flood control for some areas as before.

Although a set of flood control measures in each zone were proposed and approved by the Government in 1999, the flood control plan was revised and implemented from 2000 to 2005. The Decision by P.M. Kiet in 1996 helped to bring into practice the concept of IWRM targeted in the preceding periods but restricted by the lack of coordination among different actors such as Central Government, line Ministries, Provincial People's Committees and local people. With his decision in digging canals for multipurpose in the flooded area, in 2009 the An Giang People's Committee agreed to honor his name for a 50 km canal to replace the former name T5, http://www.cpv.org.vn/cpv/Modules/News/NewsDetail.aspx?co_id=30701&cn_id=349518).

With the expansion of irrigation into the deeply flooded area, the land reclamation was at high speed during this period. During 10 years from 1976 to 1985, about 282.000 ha were converted from fallow land into cultivated land. However, during the next 10 years 1986 to 1995, only 56,000 ha were converted, possibly because under the *reform* policy that allowed farmers to decide land use systems and sold their products to market, people tried to exploit effectively their existing resources before moving into fallow land area. During this 5 year period from 1995 to 2000, the reclamation area was 473,000 ha, brought the total arable land in the MRD to 2,971,000 ha, or 74.8% of total area. So, a conclusion could be that decision on resource management at highest level provided the basic conditions for decision in irrigation at field-farm level to be realized.

During this period, with strong leadership in decision of investment, and improved economy that allowed the Government to have internal budget to implement the development plan, the role of donors was not dominant, see Box 2: the Quan Lo Phung Hiep project).

2000 onwards: Decision under diversification in a changing world

Until 2000, the significant increase of rice production due to reform policy, from about 10 million tons of paddy in 1976 to 30 million tons in 2000 has been enough for domestic consumption, and a part for export. About 2 million tons of rice in 1990 and over 4 million tons in 2000 onwards were exported. Irrigation development has to move away from the concept of monoculture with rice everywhere. Two conflicting directions in irrigation development in the MRD appeared from the beginning of this century. On one side, a conservative direction is the continuation of developing and strengthening irrigation systems for freshening the whole delta to improving rice production because of food security of the country. On the other side, the *reform* direction considers increase of rice production not a development target anymore because revenues from rice crop is very low compared with other crops, but diversification, including using saline water as resource rather than a constraint, and improvement of agricultural product quality are needed to improve income and livelihoods of farmers.

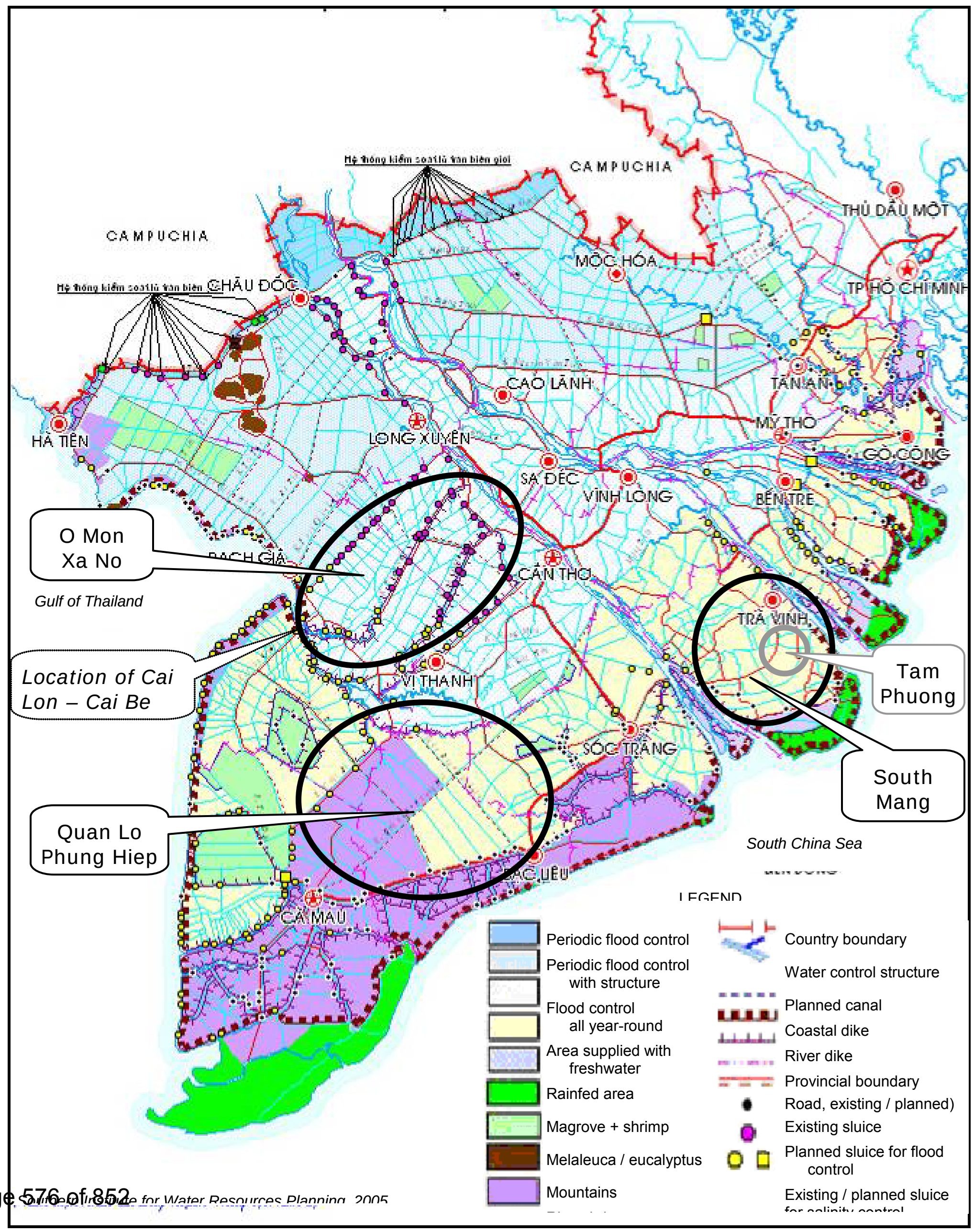
From 2000, the Government started to look for land use options that can convert about 350,000 ha of rice land with low yield in the whole country into other land use types with higher revenues. In the freshwater area, irrigation system was modified and operated for non-rice crops such as vegetable, fruit trees, rice-fish or fresh water aquaculture. These changes were mainly decided by farmers or WSG who manage small scale irrigation system. In the flooded area, the construction of infrastructure including canals and sluices for flood control and irrigation, road and settlement were continued. But the most significant changes in land use and irrigation system were in the salinity intruded zone where farmers converted their rice and agricultural land into brackish water shrimp fields because revenues from shrimp for export is about 10 times higher than rice, see Box 2: Quan Lo Phung Hiep project). The area of aquaculture in the MRD were expanded from 135,700 ha in 1991 to 289.400 ha in 1995 and 571.700 ha in 2002, of which 422.200 ha were brackish water aquaculture, mainly shrimp. Irrigation system were changed to adapt to the new land use systems, for example sluices that were designed and operated to protect from salinity intrusion in the dry season were modified or operated for intaking saline water for shrimp cultivation. The system that combined drainage and irrigation in the same canal network for agriculture is likely not suitable for aquaculture because fish and shrimp are more sensitive to water quality change and pollution than crops. Separate canals for drainage and irrigation were suggested and started to be build at small scales of farm and WSG.

However, after Vietnamese products expanded their share in global market, product prices in international market have stronger and faster influences to production systems, and subsequently to decision in irrigation in the MRD. For examples, the ban of Vietnam basa catfish into US market in 2001, the antidumping import tariff on Vietnam's shrimp in 2004 by the U.S. Department of Commerce, DOC), or the soaring of rice price in international market in 2008, had immediately influence on domestic prices of these products, and thus to area, production and inputs, including irrigation water use. Up to the time when this paper was prepared, impact of global financial crisis in 2009 on irrigation has not been seen clearly yet, but it could be clearer in the near future.

Due to diversification and uncertainties under the market-oriented economy with conflicting water demands for agriculture and aquaculture, decision in irrigation development is facing with new challenges, but these challenges are different for different actors. The Central Government has to decide the continuation of agricultural development in the country. This trend is reflected by the annual budget allocated to line Ministries. In 2006, MARD budget, ranked second behind that of the Ministry of Transport, was 3,154 billion VND, 197 million US$) of which 2,018 billion VND, 126 mil US$, 64%) was allocated to infrastructure investment. At lower levels, under the economic decentralization process, the provincial and district authorities have to decide which irrigation system in their territory is invested or strengthened to provide suitable conditions for improving production and livelihoods of local people. The Construction Companies and the Hydraulic Works Management and Operation Companies are also facing with the process of financial independency without subsidy and competition in market requested by Central Government.

Donors are also facing with new challenge. A mission of World Bank team was recently organized in August 2009 to prepare a project on Mekong Delta Integrated Rural Development Project for 2011-2015, but the Vietnamese agencies are interested to getting new financial supports for the construction of 2 large sluices, the Cai Lon and Cai Be to completely enclose and freshen the central part of Ca Mau Peninsula, although the effects and impacts of these sluices still need more studies. A review of the implementation of Master Plan 1994 to prepare for a update Master Plan and new investment projects was also suggested, although water resources development plan is revised every 5 or 10 year and usually contains more and more heavy construction infrastructures for fully control water conditions, Figure 4).

Under the diversity in a changing world, making decision in irrigation development in the MRD is more difficult than before, therefore likely the key decision makers are those who are controlling the allocation of fund for irrigation, including new construction, strengthening or rehabilitation, or maintenance and operation.



Source: Institute for Water Resources Planning, 2005

Figure 4: Water resources development plan in 2010, Source: SIWRP, 2005).

Contribution of irrigation in the Mekong River Delta in last 35 years

With the above decisions during last 35 years, irrigation has contributed significantly to the increase of rice production in the MRD. In 1975, the total rice area was 1.86 million ha, 24.5% of floating rice, 59.1 % of transplanted rice and only 9.0% of double rice) and the total rice production was 4.7 million tons, corresponding to a rice yield of 1.5 to 2.0 tons/ha. In 2004, the total rice area was enlarged to 2.06 million ha, but area of double or triple rice was 72% and the total rice production was 18.5 million tons. With irrigation water, and combined with other agricultural practice, farmers in the MRD was able to achieve an average rice crop of over 4 tons/ha.

Discussions on decisions in irrigation

Evolution of decision in irrigation development

The following tables give an overview of the policy evolution in irrigation development in the MRD from the 1975 onwards. The comparison of this evolution throughout the 7 periods in last 35 years clearly shows that decision varied with policy views and involvement of actors in the process with targets not only for irrigation itself but for the outcomes of irrigation development.

Table 2: Comparison of irrigation decision in each period

	1975	1976-1977	1978-1980	1981-1985	1986-1995	1995-2000	2000-onwards	Remarks
Main feature	Irrigation developme nt without plan	RRD blue print	Political will at any price	Emerging role of research as part of decision-making process	Irrigation reform	Strong leadership	Diversification in a changing world	
Policy objective	Using existing labour force	Increase rice production	Increase rice production	Increase rice production	Irrigation as a condition to improve people's livelihoods	Increase rice production through flood control	Divided between increase rice production and crop diversification	The need to increase rice production is linked to its role in improving farmers' living standard
Leading actor	Provincial, district and commune authorities	MWR and farmers	Country's top leaders	• Country's top leaders • MWR • Scientists • Provincial People Committees	• Farmers / WSGs • Irrigation planners • Central government • Provincial, district and commune authorities	Late Prime Minister Vo Van Kiet	• MARD • Farmers / WSGs	Parallel relationship between state actor, MWR or MARD in late periods) and farmers
Decision-making process	Centralized political decision	Centralized at national level and decentralized at community level	Centralized political decision	Emergence of polycentric decision-making	Centralized quasi polycentric or deconcentration	Strong personal leadership	Centralized and decentralized at the same time	A mix of centralized, decentralized and quasi polycentric
Policy milestone	n/a	Formulation of Water Resources Development Plan, 1976-1980) followed by installation of large pumping	High investment in irrigation infrastructure development	Formulation of irrigation plans referred to agro-ecological and socio-economic conditions	Incorporation of irrigation development into *reform*	IWRM by integrating irrigation with navigation settlement & rural development	Expansion of aquaculture area by farmers	Farmers take a more active role in shaping the policy milestone

		stations						
Policy outcomes	Pollution of acidity into canal system in and around ASS areas	Farmers continued to use small pumps rather than depending on large pumping stations	Rice production did not increase as fast as expected because farmers lack the motivation	Same as in previous period	Rapid increase in rice production due to expansion of double and triple rice crop area	Rapid increase of reclamation area	n/a	Farmers' response to the defined policy is crucial in shaping the policy outcomes/success

Who are the actors in irrigation development decision-making?

Through the decision-making processes described above, the following actors are identified and their involvement is discussed:

National Assembly: in principle, National Assembly, as representative of all people of the country, is the highest decision body for all development programs, including irrigation development. However, many National Assembly members are Government officers, including Prime Minister and Ministers, Chairman of Provincial People Committees and Departments, therefore their decisions are strongly influenced by the central Government policy views.

Central Government and line Ministries, in particular the Ministry of Water Resources, MWR, merged to MARD in 1995): the key actors who prepare and decide the development programs, including irrigation, in the whole country. Therefore their decisions cannot only focus to the MRD, but are based on a relatively equal development for all regions in the country. Even in the MRD, equity in development opportunities are also taken into account through the allocation of budget for irrigation development.

Provincial People Committees and line Departments: in principle, these are also key actors in irrigation development in their provinces. However, their roles depend on the centralization and decentralization processes that vary during different periods. For example, MARD has tried to establish a river basin organization, RBO) for the MRD by support of donors such as Australian Government to respond to the requirement of coordination in water control by provinces that is sharing a common irrigation system as the Quan Lo Phung Hiep project. However, while the provincial water managers need to interact regularly in decision on operation of the sluice system for satisfying water requirement for rice and shrimp crops, in 2005 the Minister of MARD signed a decision for the establishment of an RBO for the Quan Lo Phung Hiep system with functions focusing more on giving policy and direction rather than operation. The RBO Committee, led by a Vice Minister and the Director General of DWR based in Ha Noi, meets only once a year, and the office is located at the southern office of DWR in Ho Chi Minh City.

District and Commune People Committees and line Departments: the roles of these actors are mainly to build and operate irrigation schemes in their districts or communes that were decided by Central and Provincial Government. During some years after the *reform*, started in 1986), district was considered as an economic development unit with more power in development decision. However, due to the lack of capacity and the recentralization, they roles in decision got back to the previous.

Communities: besides the formal government systems up to commune and hamlet levels, communities exist as an informal body that influence to the development decision, in particular in land and, irrigation) water use. The relationship in the community is reflected by a fact that people in the MRD usually distinguish themselves by their original communes, i.e. their life links closely with the commune where their family is based. Therefore local people usually pay much attention and share opinion on decision with others in the community.

Water Sharing Group (WSG) and Farmers: obviously irrigation decision at field-farm level is decided by individual farmers. However, all the farms in the MRD are linked to a very dense canal and river network of principal, primary, secondary, tertiary and on-farm system, Fig. 4), therefore a WSG is usually formulated by farmers who are sharing the same water course. In some cases, the WSG becomes an official body, similarly to a formal Farmer Cooperative during some periods) that is accepted in the commune, but in most cases the WSG is operated by moral agreement without any paper.

Irrigation Project Management Boards (PMBs), Dredging Companies, and Hydraulic Works Management and Operation Companies: these are state or provincial authorities implement the irrigation projects. PMBs, one for the Mekong River Region, and the other for the Bassac River Region) are operated as Government agencies that manage the irrigation investment, supervise the project implementation. The Dredging or Construction Companies dig the canals and build the constructions as sluices, pumping stations… of the project. After constructed, the irrigation systems then were transferred to the Hydraulic Works Management and Operation Companies for operation and maintenance. Although these agencies or companies, in principle, do not involvement in irrigation decision, but somehow they directly contribute or control the efficiency of irrigation projects and thus the decision of the future projects.

Private sector and agricultural product consumers: these actors are still playing minor role in decision or investment into irrigation systems, but mainly influence through demands of agricultural products. One example is the demand of brackish water shrimp that is exported to international and domestic market has a strong influence in the investment and operation of irrigation system at the provincial and local levels in many provinces.

International donors, including lending organizations as ABD, WB: these actors have different roles in different periods. In the first few years just after war finished, the connection with donors was interrupted. The return of donors in at the end of 1970’s and early 1980’s were most welcomed because of the difficulty in country economy. This situation lasted for over 15 years because the country still needed external support for irrigation development. However, from the late 1990s the improvement of country economy has allowed more national budget for development projects, irrigation development has less depended on external funding sources, hence roles of international donors has been less critical. Although supports from donors are still preferred and decided by Central Government, provincial authorities started to question whether such supports are really needed, in particular about the loan that future generations will have to pay back.

Centralization vs decentralization

Current debate on decision-making pattern in irrigation development centers on polarized views towards centralization and decentralization, Fontenelle, 1999; Fritzen, 2006). The Vietnamese MRD case shows, however, that the crucial issue in irrigation decision making lies in the ability to synergize government’s policy objective with farmers’ development needs, rather than the need to choose the path of centralization and decentralization per se. Between 1986-1995, rapid increase in rice production was achieved through development collaboration between the government’s and farmers’ efforts: the first through its policy decision to expand high value agriculture area, and the latter through their motivation to change/adapt their cropping system and increase irrigation water use accordingly. This evidenced that there is no direct link between successful policy outcome and the formation of farmer organization as a prerequisite for farmer participation, as this is often advocated by international development agencies. On the contrary, the MRD case also shows how farmer participation took place outside the internationally defined institutional/organizational framework of Water User Associations. The irrigation policy evolution in the MRD shows the importance to capture farmers’ actual development needs within the defined policy framework, rather than to promote prescribed farmer participation.

This remark is not to give the wrong impression with regard to the importance of farmers’ role as development agent in irrigation. Irrigation development policy outcome relies primarily on farmers’ ability and response. Policy evolution in the MRD evidenced the important role played by farmers in shaping the actual policy outcome. It should be emphasized that the need to involve farmer in decision-making process should be based on farmer's willingness to participate in the process, rather than as a formal development requirement.

The evolution of irrigation policies in the MRD shows that Government of Vietnam's current achievement in agriculture development, in term of increase rice production) is rooted in its past decision to involve researchers in the overall decision-making process, and thus its ability to see the importance of creating a room for policy discussion as a medium to gather, technical) information. The way the government distinguished its water resources development plan, 1981-1985) according to the different agro-ecological and socio-economic conditions in the MRD brings into light an important transformation in the decision-making pattern in Vietnam irrigation development from centralized political decision based on blue-print development model to a more comprehensive decision supported by the necessary technical and contextual background and information.

The fact that this policy discussion is focused on technical issue in water resources management, not always involving farmers and other non-state actors shows that this policy discussion still was framed within the centralized decision-making pattern in irrigation development context at that time. In this context, stakeholder participation and involvement in the decision-making process becomes a less prominent issue vis-à-vis government's ability to gather information that is crucial for defining the outcomes of the proposed policy. Nevertheless, farmers' lack of motivation to increase rice production due to government's administrative measures highlights government's inability to connect their defined policy with farmers' development interest. Fortunately this mistake was corrected in the *reform* period.

The role of researchers in stimulating policy debate/discussion in irrigation development is an important first step towards the establishment of polycentric decision-making mechanisms. As discussed in the earlier sections, scientific/technical debate/discussion on the issue of flood control enables the provincial government to question the central government's decision and thus negotiate their development perspective vis-à-vis the defined policy guideline or decision.

The question remains, however, how Vietnam can use its experiences in irrigation policy formulation in the past to define its future irrigation policy direction. Currently, Vietnam is facing major challenges to cope with the changing development tendency from rice-focused to diversification, and to a certain extent from infrastructure-oriented to farmer-focused development. In the next section, the concept of polycentric decision-making is introduced as a conclusion of this paper. Its potential role is allowing the Vietnamese government to embark on their new policy journey in irrigation development.

Back to the future: A new hope in irrigation development?

Polycentric decision making4 has the potential to cope with future challenges for irrigated agriculture, which is to improve land and water productivity in relation to the global attempt

[4] Neef, 2009) introduced that the institutional theory of polycentricity was first developed by Ostrom in 1961 for the study of collective goods in metropolitan areas. It was only recently that the concept of polycentricity gained currency both as a theoretical construct and an analytical framework of multi-scale and multi-stakeholder water resource governance systems in non-urban areas. Polycentric governance regimes have been described as "complex, adaptive systems without one central authority dominating all of the others in regard to all policy arenas".

to reduce environmental damage, Comprehensive Assessment of Water Management in Agriculture, 2007). This potential lies in its ability to fit into the changing, evolving characteristics of water resources management from single objective, for crop production) to multiple functions, including domestic and industry water uses, environmental services), as well as from single crop to multiple crop and crop diversification. In this context, polycentric decision making can direct the path of irrigation investment strategies, based on the development interests of different stakeholders, within but not limited to the agricultural sector.

Polycentric decision making addresses weaknesses of both centralized and decentralized decision-making systems, and at the same time synergizing the systems' strength points. In the first place, polycentric decision making offers a conceptual and practical alternative to cope with the present physical and institutional inertia embedded in decentralization trends. Conceptually, polycentric decision making has the potential to resolve the scaling constraints for both centralized, down-scaling) and decentralized, up-scaling) decision making. Polycentric decision making links state's agency's macro knowledge and understanding of system management with farmers' local knowledge and experience with regard to their micro level farming practices. For instance, it provides the state an access to grass-roots decision-making processes, while parallel to this it also gives farmers access to information with regard to government policy interventions.

Secondly, polycentric decision making has the potential to address the problem of state fragmentation and the issue heterogeneity in general, in relation to farmers' farming systems, decisions, and their development perceptions) as it focuses o the variation of stakeholders and their multiple perceptions, positions, and interests at multiple levels, hydraulically and administratively). Similarly, instead of running the risk of excluding any actors, it emphasizes on the need to include all actors, as well as the necessity to synergize their involvement. In addition, polycentric decision making does not only create a new decision-making platform with better access to information, but it also provides a greater room for manoeuvre for all actors involved, and thus more coordinated decision-making basis to reorient or redefine their development roles in relation to their, changing) perceptions and interests.

Thirdly, polycentric decision making allows for experimentation in developing rules to fit a range of conditions, Ostrom et al., 1993). This characteristic is very important in shaping the system's flexibility and adaptability to a changing environment.

For the Vietnam context, polycentric decision making has the potential to enable the state to interact with all stakeholders and to converge their different interest as to increase the chance to have a win-win policy direction as well as to prevent repeating past policy mistakes. The different policy periods show how the government attempts to achieve its goal to increase rice production through agriculture extensification, then intensification, and back to extensification and crop diversification. The existing technical infrastructure in irrigation system is crucial in defining the actual direction(s) of this policy, re)shift.

In addition, Neef, 2009) proposed that polycentricity and deliberation should be viewed in a configurative sense. Polycentricity may be seen as the number and density of nodes, actors) and links, interactions) in a resource governance regime, while deliberation refers to the power relations among these actors and the frequency, quality and depth of interactions, i.e. the modes of communication and decision-making, negotiation and coordination mechanisms, information flows, and approaches to mediation and conflict resolution. This suggestion is quite useful for the decision in irrigation of the MRD. Although it is a long way to achieve the real polycentric decision making in irrigation development, the evolution of decision making process has showed some indications of such direction.

As formulated by Biggs et al., (2009): "To what extent are future development choices constrained by the weight of a history of past choices supporting the state's technological domination over water environments?" highlights how technical characteristics of large-scale irrigation systems in the MRD reflect the centralized decision-making structure in the country's irrigation system management. Moreover, as observed by these authors: *"The way in which delta master plans and basin management schemes have been established in the past has produced trends towards technocratic management and solutions that favor major modifications to the river's hydrology that remain problematic in the present"*. This lasting effect was evidenced from the way investment in irrigation and water control in the MRD continued to be focused on large-scale infrastructure projects, following the construction legacy of past projects, the Go Cong pioneer agricultural project, and the construction of anti-salinity dikes in Quan Lo Phung Hieu project. Yet, at the same time, farmers' ability to convert agricultural land into brackish water shrimp fields as well as their ability to modify small-scale irrigation systems towards integrated farming evidenced that the existing technical characteristics of the irrigation system should not be treated as a static element in irrigation policy development. On the contrary, technical modification and to a certain extent the restructuring of decision-making process in irrigation development is possible if this is in line with farmers' development needs. Within this context of policy uncertainty, polycentric decision making can be introduced as a new mechanism to develop new rules in irrigation development. These new rules centered on the coexistence of rice farming and crop diversification/aquaculture, as to find ways to optimize both type of farming. Irrigation policy direction in the MRD should then be referred to this process of rules formulation.

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Irrigation Expansion in Cambodia: Understanding the Process of Decision-Making

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Abstract

The push for irrigation expansion has been an important public policy issue and the subject of numerous development discourses in Cambodia. Some of the key policy makers in Cambodia argue that without large-scale irrigation schemes, subsistence farmers will remain trapped in a life of poverty and hunger. However, with limited government budget allocation, the sector remains weak and dependent on external assistance both financially and technically.

One of the new donors interested in irrigation development in Cambodia is the well-known oil-rich gulf state of Kuwait that has promised to loan US$546 million in soft loans to Cambodia for an infrastructure project primarily focused on the agricultural sector. Of this amount, $360 million will be used to construct an irrigation system (130,000ha) and a hydropower project (40 MW) on the Stung Sen tributary of the Mekong River in Kampong Thom Province.

This paper will attempt to review the politics of decision-making behind the current irrigation expansion in Kampong Thom Province, which is one of the six provinces around Tonle Sap Lake. There have been 488 irrigation schemes identified in the province with potential irrigation areas of 140,000 ha. The attached case study focuses on the existing irrigation system in Stung Chinit tributary and the current plan for a hydropower and irrigation system on the Stung Sen tributary. Both tributaries are located in Kampong Thom Province on the northern side of Tonle Sap Lake in central Cambodia.

Introduction

In an effort to encourage economic growth, generate employment, and reduce poverty, the Cambodian government adopted the "Rectangular Strategy[i]" in 2004. Building upon this strategy, the government designed the National Strategic Development Plan 2006-2010 (NSDP) which identified key sectors to prioritize investments for meeting the goals and development targets of the Cambodian Millennium Development Goals (CMDG). The NSDP outlines the priorities in each sector including good governance, health, education, economy, and agriculture.

In the wake of the 2008 food crisis, the Royal Government of Cambodia has renewed its effort to establish the country as an important exporter of rice. As a result, agricultural expansion, including irrigation system development, has become an important development in the country. The need for irrigation systems to improve rice productivity and crop diversification has been commonly cited by both government officials and many development agencies.

It can be argued that better irrigation systems and the expansion of land use are crucial if the government is to accomplish its ambitious goal of producing 15 million tons of rice per year by 2015, which is more than double the 7.1 million tons currently forecast for this year. Rice production for 2007 and 2008 was 6.76 million tons.

The Minister of Agriculture has been quoted in the press[ii] as being confident that Cambodia can expect to export 8 million tons of paddy rice by the year 2015. The minister has argued that Cambodia's closest neighbors, Thailand and Vietnam, were the first and third largest rice exporters in 2007 with 9.5 million and 4.5 million tons respectively. One rice dealer with a trading house in Singapore estimated that Cambodia exported 600,000 to 800,000 tons per year directly or indirectly via Thailand, and that those numbers could increase to 1.5 million tons in one or two seasons if the government was focused. However, he was skeptical that 8 million tons is feasible in such a short time. Obviously, these numbers would require more that just increased yields. Twice-yearly harvests and extensive expansion of cultivated areas would also be required.

The recent master plan published by JICA in 2007 showed the Tonle Sap Lake and its catchments areas to be the most important region in the country for poverty alleviation as well as overall economic development. However, there were some major problems identified by the master plan. They included:

- A low ratio of farms currently under irrigation
- A lack of comprehensive rehabilitation work in the region
- Deterioration of plot bunds
- A low ratio of establishment of FWUC
- Insufficient canal capacity
- Degraded irrigation structures

The outcome of the study justifies the four major reasons for irrigation construction and renovation:

1. The need for effective water resource utilization, particularly in those areas dominated by rain-fed agriculture where the existing irrigation systems are malfunctioning

2. The search for effective land utilization in those areas often affected by flood drought such as the areas surrounding the Tonle Sap Lake

3. The importance of effective human resource management because of this sectors influence on operation and maintenance of infrastructure improvements

4. The dire need to achieve stable food supply and poverty alleviation in the areas surrounds the Tonle Sap Lake.

Because of limited financial capabilities and technical skills, the government has to depend on external development agencies such as ADB, France, Japan, Australia, and South Korea, to meet these needs (For more information on donors, please see table 1). One of the newest donors is the oil-rich gulf state of Kuwait that has promised to loan $546 million USD in soft loans to Cambodia for an infrastructure project, which will focus primarily on the agricultural sector. Of this amount, $360 million USD of the loan will be used to construct an irrigation system (130,000ha) and a hydropower project (40 MW) on Stung Sen tributary in Kampong Thom Province. The total catchment of the Stung Sen Tributary is 16,250 km^2, the largest of the 12 tributaries that flow into the Tonle Sap Lake. The total catchment area of the 12 tributaries is 86,140km^2 with an average annual run off of 76,000 million m^3.

The remaining money from the Kuwait loan will be used for road construction in Battambang Province.

Objectives

This paper provides preliminary reflections on the current proposed and on-going irrigation developments and agricultural transformations in Kampong Thom Province. It explains the ecological and economic setting of the provinces, the rationale behind irrigation expansion, the current proposed development of Stung Sen and the lessons learned from existing irrigation scheme in Stung Chinit. The paper responds to questions on how Cambodia is currently making decisions concerning the extensive new irrigation development. It also explores how decisions are being perceived in the Mekong Region about new schemes vis-à-vis modernization of the existing infrastructure.

This paper is organized into six sections. The Introduction or first section gives basic information on the background of irrigation development in Cambodia and the reporting process used to develop this paper, the second section (Current Situational Analysis) provides information on the current situation in Cambodia, the need for irrigation expansion, the current irrigated areas, and food security issues. The third section (External Development Partnerships) describes the overall external development in water and irrigation systems, the current development on Tonle Sap tributaries and government investments in irrigation systems and agricultural sectors. The fourth section (Case Studies on Current Irrigation Projects) presents case studies from Kampong Thom Province examining the two large-scale irrigation schemes currently in place. Complex ecology and issues are also presented. Section five (Expansion and Decision-Making Methods in Irrigation Development) deals with irrigation expansion and decision-making in the provinces. This narrative begins at the regional level and works up to the national level, including the political drivers and lessons learned from the existing scheme implementation. Finally, the Conclusion, or final section, reflects on the decision-making mechanism and gives suggestions for irrigation investment.

Methods

The methods used in this paper build on the previous work done by a research fellowship on irrigation and water management from 2006-2008, which was hosted by the Cambodian Center for Study and Development in Agriculture (CEDAC).

The researcher conducted three field visits between 2008 and 2009. The first field visit took place in late 2008. Several key informants were interviewed including representatives from the provincial departments of environment, agriculture, water resources and meteorology; senior provincial program advisors for projects to support democracy and decentralization; NGO workers from CEDAC/GRET; a former officer of the Fishery Action Coalition Team (FACT) based in Kampong Thom; and a Farmer Water User Committee (FWUC) for the Stung Chinit irrigation scheme. The researcher also had the opportunity to travel along the Stung Sen tributary to areas surrounding the provincial town and to visit the flood plain of the Tonle Sap Lake starting with the Stung Chinit irrigation scheme and on to various irrigation schemes along the Stung Sen River.

The second visit took place in August 2009. The researcher met with the FWUC at Stung Chinit to consult on the current status of the irrigation operation and maintenance. The representatives from the Irrigation Service Center (ISC) based in Kampong Thom were also consulted regarding the current irrigation management in that province. The researcher was also able to consult with the irrigation construction company, regional director of IWMI, and many of the donor agencies in Cambodia during the August 2009 visit. The third visit took place in November 2009 where deputy provincial governor, local authorizes and communities in Sambo commune of Sambo district along Stung Sen were also consulted and interviewed.

The author also met with senior officials from MOWRAM regarding the challenge of irrigation development and expansion in Cambodia. The researchers also had a chance to attend informal discussions between various departments from MAFF, MoE, and experts from the Council for Agriculture and Rural Development (CARD) under the Office of Council of Minister regarding natural resource management, agricultural performance, and roles and responsibilities of each department in future work related to these areas. The researchers also attended a national workshop organized by MOWRAM and AFD on February 11, 2009 entitled “Moving toward a Sustainable Operation and Maintenance of Irrigation Schemes in Cambodia.”

In addition to the above mentioned field visits and meetings, the research team was able to visit selected irrigation schemes in other provinces in Cambodia to learn more about governance issues related to irrigation. Finally, the CEDAC Irrigation Work Group held three discussions to develop and prepare this paper.

Current Situational Analysis

Cambodia covers an area of 181,035km^2 of which 54.1% is forests, 23.4% is used for agriculture, 6.8% are wetlands, 15.6% is wood and grasslands, and 0.1% are settlements (Save Wildlife Cambodia, 2006). Cambodian agriculture is predominantly organized into small farmer communities. The plight of these communities access to natural resources and land ownership is possibly one of the most significant land use issues facing Cambodia today.

The National Institute of Statistics[iii] estimated the population of Cambodia to be 13.4 million, which represents an inter-census annual population growth rate of 1.5%. There are 94 men for every 100 women. Nearly three-quarters of the country is under 30 years old and were born after the end of the Khmer Rouge regime in 1979. It was estimated that 85% of the total population relies on a fragile balance of agricultural, fisher, and forestry products for survival.

The UNDP (2008) estimates that 40% of Cambodia’s people (5.4 million) are living in poverty (defined as living on less than $1.25 USD per person per day). The Cambodian Government, using its own poverty line of $0.50 per day, estimates poverty at 30.1% of the population, a decrease from 34.8% in 2004. Rural poverty is 34.7%, down from 39.1% in 2004, and poverty in Phnom Penh fell from 4.6% of the population to 0.8% in 2007. Despite these decreases, an increasing trend in inequality among the population is being observed.

With such high poverty rates and the hopes of increasing rice exports justified by the recent food crisis of 2008, the government has furthered its interest in increased rice production to meet domestic needs and to capitalize on the opportunities for expanding exports. Cambodia is situated in the Mekong basin, in between the world’s top two rice exporting countries - Thailand and Vietnam (Randey and Bhandari, 2009) – and has the potential to participate in this well-developed export market (despite poor export performance in the recent past because of various constraints).

The Need for Irrigation Expansion

Many Cambodian farmers are able to harvest rice only once annually because of the lack of a consistent water supply. However, with their superior irrigations systems, both Thailand and Vietnam have managed to harvest two or three crops per year, a considerable comparative advantage for the export market (although in Thailand this has not been achieved in the Northeast region, which is in similar to Cambodia in terms of soil and fertility).

The current Strategy for Agriculture and Water 2009-2013 aims to ensure enough safe and accessible food and water for all people; reduce poverty while increasing the Gross Domestic Product per capita; and ensure the sustainability of natural resources. The goal for agriculture and water resources management is to support poverty reduction, food security, and economic growth by enhancing agricultural productivity and diversification and improving water resources development and management (TWGAW, 2007). The strategy has laid out five program areas to focus on with the help of financial assistance from donors and technical assistance from working group experts:

- Institutional capacity building and management
- Food security support
- Agriculture and agri-business support
- Water resources, irrigation, and land management
- Agricultural and water resources research, education, and extension services

The Tonle Sap Lake and its tributaries make up a very important region, not only for mitigation of poverty but also for the economic development of the country. A JICA study in 2007 suggested that in order to optimize the land use in the River Basin area, integrated agricultural development plans should include both irrigation and rain-fed areas of the four river basins of the Tonle Sap Lake.

Senior officials from MOWRAM agreed that water is important for supporting agriculture productivity and acknowledged the need for large amounts of money and investment for irrigation and infrastructure. Most irrigation systems were built during the Khmer Rouge regime from 1975 to 1979. Most of the systems that remain are in poor condition. Recently, severe droughts and flood have affected most of Cambodia. MRC proposed various water storage strategies and dam construction projects between 1957 and 1995; however, none of them were constructed in Cambodia. On August 24, 2009, Mr. Veng Sakhon, Secretary of State of MOWRAM, argued that farmers who continue to use their traditional methods to cultivate rice without using dikes to store water would continue to be vulnerable to drought for the next five to ten years. Therefore, there is a need for canals to connect water from water sources to the paddy fields.

Current Irrigated Areas

Information on the current irrigation systems and the actual irrigated areas is available from several sources. The MOWRAM inventory in 2007 showed 2,402 irrigation schemes with total irrigated areas of 1,046,263 ha in all the provinces (IFC and DAI, 2008). With support from various External Development Partners - including the Government Counterpart Fund and National Budget - 253 irrigation schemes of varying scales have been rehabilitated or constructed from 1999 to 2006, securing in which water for rice cultivation over an area of 716,453 ha (32% of Cambodia's total rice cultivation area). Flood-control dikes protect 130,550 ha of land and sea-protection dikes (Polders) protect 18,390 ha from sea intrusion. More than US $76,700,000 has been used for the aforementioned rehabilitation projects (Sakhon, 2007).

According to a survey conducted by CEDAC in 2008, an irrigation inventory covering 13 provinces with a total cultivated land area of 2,327,024 ha and a population of

11,560,708 recorded 2,525 irrigations schemes with a wet season irrigation surface potential of 901,543 ha (equals 39% of the total cultivated land are) and 321,167 ha of surface irrigation during the dry season (equal to 14% of the total cultivated land). The survey classified the schemes into 3 categories: Functioning Well, Partially Functional, and Not Functional. Characteristics of the "Functioning Well" irrigation schemes included good quality reservoirs, dams, and other structures as well as a distribution network system in good condition and able to function to at least 60% of the original designed specs. The "Partially Functional" irrigation schemes were those operating at 40% to 60% of the original specs, and those operating at less than 40% were classified as "Not Functional." According to the available data, of the 2,525 of recorded irrigation schemes, only 6% fell in the "Functioning Well" category while 32% were classified as "Partially Functional", and 62% were considered "Not Functional" (CEDAC 2009).

Food Security

Food security issues for rural households and the desire to increase exports are two of the driving factors pushing irrigation renovation and construction. According to MAFF, the rice balance for 2008-2009 shows a surplus of 2,025,033 tons of milled rice[iv]. This sector generates 34.4% of the GDP compared to the industry sector's 23.8% contribution and the 41.8% generated by the service sector. The gross value-added income increases for agriculture explains the increased value of this sector from 5,078 billion Riel in 1999 to 7,174 billion Riel in 2007, and 7,562 billion Riel in 2008.

Despite being largely self-sufficient in rice and food production, Cambodia experiences regional and seasonal problems of food availability. Thirty percent of the population lives under the Cambodian government's definition of poverty - US$0.50 per day per person. Nation-wide, 23% of the population was food-deprived in 2008, consuming less than the daily intake requirements of 1,715 calories per person.

The food security and poverty situation varies between regions and social groups. Geographically, 90% of the country's poor live in the rural areas[v]. Phnom Penh, the capital, has a poverty rate of only 4.6% as compared to the provinces around the Tonle Sap Lake or the Upland Mountain regions that have poverty rates of 42.8% and 52.02%, respectively. Even within provinces there exists a wide variation in nutrition intake and food availability. These variations can be seen by examining commune-level statistical data. For example, stunted growth rates in children under the age of five are reported to range from 17-75% at the commune level - an alarming variation.

External Development Partnerships in Water Resources and Irrigation

This section illustrates the current projects on irrigation investment, the search for new donors and the investment made by government.

Current irrigation investment

The amount of governmental budget and technical skill allocated to agricultural extension and development has remained a sensitive subject. It is clear that major sources of investment come from both grant and loan from external development agencies and bilateral aid. There are 18 sector-related activities to agriculture with funds totaling US$627,149,194.23. Three major sectors received outstanding support from external donors: emergency food aid, natural resource management, and irrigation and water resource development. Data obtained from the Council of

Development for Cambodia (CDC) in August 2009 showed irrigation and water resource development received financial assistance of almost US$200 million.

In addition, official and the most valid data provided by Cabinet of MOWRAM in mid-October 2009 revealed 26 projects were officially approved of which 10 projects are grants with total fund of US$94,480,000 and 16 projects are loans with total budget of US$1,008,200,000. Listed below are the projects being active from 2008 to 2015.

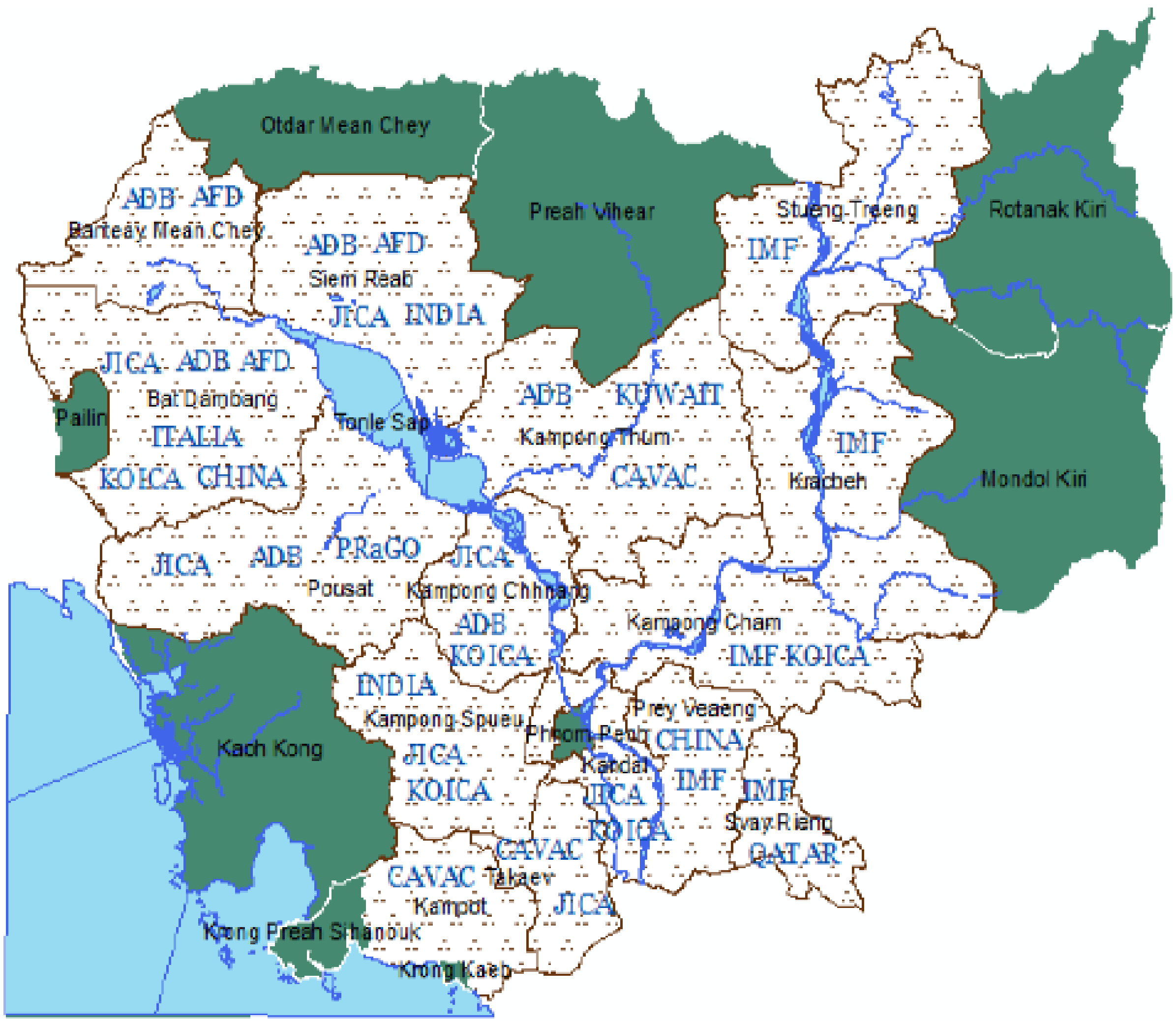
Table 1: Irrigation and Drainage Development Projects for External Development Partners

No.	Name of Project/Program	Project Cost (US$)		Implementation Period
		Grant	Loan	
A- Japan International Cooperation Agency (JICA)				
1-	West Tonle Sap Irrigation and Drainage Rehabilitation and Improvement Project		60,000,000	2010-2015
2-	Kandal Stung - Bati Irrigation Rehabilitation Project		22,000,000	2011-2014
3-	Upper Slakou River Irrigation Rehabilitation Project		24,200,000	2011-2014
4-	Small Scale Infrastructure Projects (Japanese Irrigation Sector Loan Project)		59,300,000	2010-2013
B- Asian Development Bank (ADB)				
1-	Northwest Irrigation Sector Project		30,000,000	2008-2010
2-	Tonle Sap Lowland Irrigation and Rural Development Project		20,000,000	2009-2013
3-	Water Resources Management Sector Project		20,000,000	2010-2015
C- International Monetary Fund (IMF)				
1-	Eastern[vi] Water Resources Development Project (Phase -I)	33,380,000		2008-2010
2-	Eastern Water Resources Development Project (Phase -II)	19,500,000		2011-2013
D- French Development Agency (AFD)				
1-	Northwest Irrigation Sector Project	3,700,000		2008-2010
2-	Water Resources Management Sector Project	10,000,000		2010-2015
E- Korean International Cooperation Agency (KOICA)				
1-	Batheay Flood Control Project	2,200,000		2008-2009
2-	Kraing Ponley Water Resources Development		26,700,000	2008-2013

	Project			
3-	Stung Dauntry Water Resources Development Project		36,000,000	2009-2015
F- KUWAIT				
1-	Feasibility Study for Stung Sen Water Resources Development Project	1,200,000		2009-2010
2-	Stung Sen Water Resources Development Project		360,000,000	2010-2015
G- QATAR				
1-	VAICO Irrigation Rehabilitation Project		200,000,000	2009-2013
H- CHINA				
1-	Kainghot Irrigation Rehabilitation Project		55,000,000	2009-2011
2-	Kampong Trabek Flood Control Project		35,000,000	2009-2011
3-	Stung Keo Water Resources Development Project		40,000,000	2009-2012
I- INDIA				
1-	Stung Sreng Water Resources Development Project		5,000,000	2009-2010
2-	Stung Tasal Water Resources Development Project		15,000,000	2009-2011
J- AUSTRALIA (Ausaid)				
1	Cambodian Agricultural Value Chain (CAVAC)[vii]	10,000,000		2009-2013
K- ITALIA				
1-	Kamping Pouy Irrigation Rehabilitation Project (Phase I)	2,000,000		2008-2009
2-	Kamping Pouy Irrigation Rehabilitation Project (Phase II)	4,500,000		2010-2012
L- Poverty Reduction and Growth Operation				
	Bamnak Irrigation Rehabilitation Project and other projects	8,000,000		2009-2010
Grand Total		94,480,000	1,008,200,000	

Table above shows US$94,480,000 of grants and US$1,008,200,000 of loans for irrigation and drainage system. Major donors include JICA, ADB, IMF, AFD, KOICA, Kuwait, Qatar, China, India, Australia, and Italia. Grant from IMF is part of debt canceling of US$82 million to Cambodia for rural development of which $52,880,000 goes to irrigation work managed by MOWRAM and the rest go to water sanitation and clean water managed by Ministry of Rural Development. This amount did not report the current loan from Korea with $200 million and China with $850 million. Outstanding loan come from Kuwait with $360 million approved, follow by Qatar of $200 million, JICA with $165 million, China with $130 million, ADB with $70 million, Koica around $63 million and India with $20 million. Total loan for irrigation and drainage work officially approved up to early October 2009 shows more than US$1billion (US$1,088,200,000). It is noted that these funds are managed by MOWRAM, while other sectors related to agricultural production and extension are managed by MAFF.

Figure 1: Map showing irrigation projects 2008-2015



Map above shows major irrigation area being proposed and developed along Mekong floodplain and Tonle Sap Great Lake as well as Tonle Basac floodplain in Cambodia.

Cambodia also receives favorable debt relief from international banks. IMF has qualified Cambodia for debt relief program under the Multilateral Debt Relief Initiative (MDRI) of US$82 million equivalent. The objective of debt relief is to support the government's effort to reduce poverty in the rural areas of eastern Cambodia through enhanced agricultural production, thereby alleviating food insecurity and improving farming household incomes. The immediate objective is to improve use of water resource and take advantage of the potential for irrigated agriculture through (i) improved water resource management by rehabilitating/upgrading small-and medium-scale irrigation schemes and other water management infrastructures; (ii) strengthened capacity of communities and institutions to plan, implement, manage, and maintain such infrastructure; and (iii) improved agricultural support services to the beneficiary water users.

The fund covers three sectors. The first two sectors refer to Eastern[viii] Rural Irrigation Development Project (ERIDP) that is being implemented by MOWRAM while Ministry of Economic and Finance is responsible for overall supervision of the project. This project includes: (i) rehabilitation and development of irrigation infrastructure, and (ii) improvement of irrigation management through strengthening of farmer's water user communities. Under ERIDP about 50 irrigation sub-projects in small and medium scale category (small <200ha < medium <5000 ha < large) will be rehabilitated or developed. No large-scale irrigation schemed will be rehabilitated or developed under this project. All activities were planned to be completed by the end of 2009. Now the government has agreed to utilize US$52,880,000 for two phases: phase one with US$33.38 million from 2008-2010 and second phase with US$19,500,000 starts from 2011-2013.

The third sector is implemented by Ministry of Rural Development (MRD) on clean water, safe drinking water and sanitation with total fund of around US$30 million. This project covers the western provinces to include Battambang, Banteay Meanchey, Siem Reap, Kampong Thom, Udor Meanchey. IMF required government to have money in hand and use it directly to alleviate poverty in rural areas or for rural development and rehabilitation.

Two major project documents are relevant at the time of writing this paper. First the ADB[ix] project on Kingdom of Cambodia: Tonle Sap Poverty Reduction and Smallholder Development Project" showed US$48.82 million to be invested from 1 January 2010 to 31 December 2017. The project document shows ADB share of $24 million (with $6 million loan) and IFAD with $13.38 million, Government of Finland with $5 million, Cambodia government contribution $5.13 million and beneficiaries with $1.01 million. The project will be executed by MAFF covering four provinces in the Tonle Sap Basin, namely Banteay Meanchey Kampong Cham, Kampong Thom, and Siem Reap. It is expected to benefit about 500,000 households (or about 2.0 million people) in 156 communes of these four provinces through investments, training and capacity building, and livelihood field demonstrations and follow-ups. The majority of households in the Project communes involved in agricultural production have less than 1.0 hectare of usable agricultural land and are considered smallholders. Second, ADB (2008) conduct study on "Issues and Options in Agriculture and Natural Resources Sector in Cambodia" shows investment requirement for this sectors from 2009-2018 are estimated at US$4,055.81 million covering five major sectors including: (i) Infrastructure, (ii) Technology Development and Dissemination, (iii) Credit, (iv) marketing, (v) Institutional Strengthening and Service Delivery, and (vi) contingency (10%).

Another important donor is the Qatar government. Beginning in 2008, Qatar has been investing US$200 million in Cambodian farmlands across Svay Rieng Province's Vaico River. This project will irrigate over 300,000 ha of rice fields (Mekong Times, August 11, 2008). In a personal interview on July 13, 2009, the Director of the

Department of Hydrology and River Work and the Deputy Director General of the Technical Affairs Unit of MOWRAM revealed that the Master Plan for Vaico Irrigation Project has been further developed. The project now covers two provinces - Svay Rieng and Prey Veng - where the majority of the water will be diverted from the Mekong River and will irrigate around 100,000 ha. This figure is a reduction from the 300,000 ha outlined in the 2008 article.

The Search for a New Development Donor

In early 2009, the Cambodian government sent a delegation led by the Prime Minister to visit Kuwait. It was considered the first visit from the Cambodian government that aimed to expand business and trade ties with Kuwait. During a speech in Kuwait, the Cambodian Prime Minister said “Cambodia has much land that could turn to agricultural purpose, given proper investment in irrigation. The Cambodian government understands that agriculture is a key factor in strengthening and widening national economic growth, the reduction of poverty, and may prove vital as the national attempts to avoid the worst of the international financial crisis”.

Four agreements were signed during the visit including air transport services, tourism cooperation, and MOUs' dealing with the exchange of manpower and the development of Stung Sen irrigation systems in Kampong Thom Province.

Speaking at a press conference on January 16, 2009, the Deputy Prime Minister and the Minister of Foreign Affairs and International Cooperation reported that “Cambodia has land and we need money to invest. Kuwait has the money to invest in our agricultural land and the produce will be exported to Kuwait”. They support the idea that this agreement could help increase rice yields by completing irrigation projects and, therefore, help the Cambodian people to rise above poverty. The official reported that the Stung Sen Irrigation Project would cover 130,000 ha of paddy rice and lead to a three-fold increase in paddy rice harvests per year. This project would also produce up to 40 megawatts of hydroelectric power, providing electricity to the whole of Kampong Thom Province. He also reported Kuwait’s promise to help Cambodia on small-scale projects[x], which would cost up to US$20 million.

In an interview with Cheng Sarouen[xi], an irrigation engineer for MOWRAM, it was explained that the feasibility study on Stung Sen is currently being proposed for bidding with funding and technical support from Kuwait. The total funding US$1.2 million started sometimes in July 2009. The study will take from 8 to 12 months to produce. The study will focus on soil conditions, the location for irrigation construction projects and small-scale hydropower projects.

Government Investments

Government’s investments in irrigation development increased by an annual average of 2% from 2003-2006, eventually reaching about US$10 million in 2006. Irrigation investment is not attractive due to its low financial return (Narong, 2008[xii]). From a social perspective, irrigation investment does not benefit many of the landless poor, households that are nearly landless, or farmers practicing rain-fed farming or located at the tail-end of the water distribution system. However, commercial farmers can benefit from crop diversification made possible by assured irrigation.

In 2005, MOWRAM[xiii] committed to expand 25,000 ha of irrigated land per year by renovating existing irrigation systems or constructing new systems using its own resources, which increased from US$6 million in 2005 to $10 million in 2006 and $16 million in 2009. The National Strategic Development Plan 2009-2013 reports $200 million of the $1.2 billion needed for development in this sector has been secured through external donor support. However, the lack of human resources and technical skills among MOWRAM officials remains a big concern in implementing the project properly and efficiently (MOWRAM has only 2-3 irrigation engineers in each province currently).

There are promising trends in government spending on this sector. The current spending on agriculture (MAFF, MOWRAM, and MRD) has doubled from 52.7 billion Riel in 2001 to 118.6 billion Riel in 2007. The spending has tripled since 2000. Total spending on the agriculture sector increased more than 10 fold during the last decade from 18.6 billion Riel in 1997 to 200 billion Riel in 2007 (Narong, 2008). Even with these increases from the government, the funding for agricultural extension, adaptive research, and marketing is still limited.

Case Studies of Current Irrigation Development Projects

In this section, the detailed socio-ecological prospective in Kampong Thom, the current status of the tributaries and their irrigation schemes, the upstream and downstream watersheds of the Stung Sen and Stung Chinit tributaries, and the rationale behind the decision-making process will be discussed. A case study based on a series interviews and perceptions of those directly and indirectly involved with the existing irrigation scheme in Stung Chinit will be highlighted.

The Socio-Ecological Perspective in Kampong Thom

Kampong Thom is one of the six provinces surrounding Tonle Sap Lake. The province is located at the center of Cambodia, 168 km from Phnom Penh. This province is bordered by Kampong Cham and Kratie Provinces on the east, Kampong Chhnang Province on the west, Siem Reap Province to the south and Preah Vihear and Thailand to the north.

The province covers an area of 1,506,397 ha divided that can be divided into the following areas:

Cultivated areas -180,920 ha

Forest land - 1,046,000 ha

Residential land and roads - 115,850 ha

Fallow land and grassland - 162,627 ha

The province is divided into eight administrative districts, 81 communes, and 732 villages. There are 125,554 total families or a total population of 635,005 (Women make up 51.63% or 327,863). The population density is 45.9/km^2.

Rice is the major crop. The province has a vast area of wet rice cultivation totaling 161,600 ha. However, the province has only been able to cultivate 80 to 90% of this area. Wet season rice yield per hectare averages a meager 1.5tons per hectare. Dry season rice cultivation is 5,431 ha which yields an average of 1 ton/ha (Provincial Department of Planning, 2008).

In certain areas along Stung Sen River, dry season rice cultivation proved with high yield range from 4-7 tons/ha with intensive inputs includes fertilizers, pest management and good water (mostly pumping water from the river). These areas include Stung Sen district down to Kampong Svay district along the river.

The province is also rich in high quality fish resources. At the time of the study, there were seven fishing lots covering an area of 65,353 ha in four districts: Kampong Svay - three commercial fishing lots; Staung district - three fishing lots; and Santuk and Barray districts - one fishing lot. Two out of the seven fishing lots were kept as reserve lots including lot No. 2, which covered an area of 1,100 ha situated in Kampong Svay, and lot No. 4 which covered an area of 1,800 ha situated in Staung and Kampong Svay district. Fishing lots No. 1, 2 and 3 where situated in Kampong Svay while fishing lots No. 4, 5 and 6 were situated in Staung and Kampong Svay. Fishing lot No. 7 was situated in Santuk and Barray districts.

It was estimated that the average harvest per year from these lots ranged from 5,000 to 15,000 tons of fish per year while aquaculture harvests range from 3,000 tons to 4,000 tons making this province one of the leading freshwater fishery producing provinces surrounding the Tonle Sap Lake.

Tributaries and Existing Irrigation Systems

Besides an abundance of natural resources for fisheries and rice production, the province also has a complex watershed system and existing irrigation schemes.

The Tributaries

There are four major watersheds/tributaries that play an important role as water sources, waterways and social and cultural influences for Kampong Thom Province. They are:

- Stung Sen River whose total length is 265 km. It flows from Preah Vihear province to Tonle Sap Lake. An interview with the Provincial Director of Environment suggests that the stream might actually begin in the Dangrek Mountains and flow a total of 300 km to the Tonle Sap River.
- Stung Chinit runs 293 km in two districts: Santuk and Baray.
- Stung Staung has a total length of 153 km. The Chinese are conducting Project development feasibility studies on this tributary.
- Stung Taing Krasing has a total length of 103 km. Some parts of this tributary were dammed during the Khmer Rouge regime and other sections are being renovated for irrigation purposes.

Local villagers and traders use the tributaries for boats, machine boats and ships up to 5 tons as a means of waterway transportation during the wet season. Interviews with local people revealed that some parts of the Stung Sen River have a depth of 10-13 meters during September to November and up to 10,000 m^3/s flows in the river during this period (Provincial development planning 2008).

B) Current Irrigation within Kampong Thom Province

Compared to other parts of the nation, Kampong Thom Province has more existing irrigation schemes, most of which were built during the Khmer Rouge regime. The irrigation scheme inventory conducted by the CEDAC team in late 2008 showed 488 schemes in Kampong Thom Province. These figures comprise the highest percentage of the irrigation schemes compared in the country.

Large-scale irrigation capacity beings at 5,000 ha and consists of 3 schemes covering irrigated areas of 35,562 ha in the wet season and 5,662 ha in dry season. One scheme (Stung Chinit Irrigation) has been renovated with completed reservoirs and completed structures for irrigation even though it has not reached its original goal. This scheme was built during the Khmer Rouge regime with a potential for 12,000 to 15,000 irrigated ha in wet season. The current structure can only irrigate around 2,000 ha due to increased operational costs and the majority of the scheme being ignored during the renovation.

Table 2: Current Status of Large-scale Irrigation Schemes in Kampong Thom

No	Irrigation Scheme	District	Irrigated Areas (ha)		Source of water	Status	FWUC
			Wet	Dry			
1	Tumnub Peam	Staung	7,000	1,500	Rain-fed	3	No
2	30 September reservoir	Staung	21, 562	2,162	Staung tributar y	2	No
3	Stung Chinit	Santuk	7,000	2,000	Chinit tributar y	1	Yes
Total			35,562	5,662			
Note: 1 refers irrigations schemes classified as ”Functioning Well”, 2 refers to “Partially Functional” schemes, and 3 refers to “Not Functional” schemes							

The existing medium-scale[xiv] irrigation schemes consist of 120 schemes with a potential irrigated area of 56,308 ha. Existing small-scale irrigation schemes consist of 339 schemes covering an area of 22,344 ha. The total irrigation schemes are estimated at 462 individual schemes with a potential irrigated area of 114,214 ha.

The province is also vulnerable to flood and drought. In September 2009[xv], the Minister of Agriculture reported 20,000 paddies were affected by flooding, with 2,000 ha destroyed and the rest surviving only with intervention from the ministry. The Minister also acknowledged that the rice crops currently affected not only flood but drought and insects as well.

The Decision to Use Stung Sen and Stung Chinit Tributaries

Upstream Watersheds

The upstream watershed of Stung Sen and Stung Chinit is known as the only contiguous area of lowland dry evergreen and semi-evergreen forest left standing in mainland Southeast Asia. Situated to the west of the Mekong River (where four provinces meet - Kampong Thom, Kratie, Stung Treng and Preah Vihear), it covers an area of approximately 5,250 km^2 (Global Witness 2007).

The watershed is home to rare wildlife species such as elephants, gaur, banteng, tigers and the Asiatic black bear. It is critically important to the lives of some 256,000 people living in 340 villages in and around the forest. For these communities, the forest provides a livelihood, not only through resin tapping, but also by providing building materials, medicine and food. It also has great cultural significance, as it contains large numbers of burial groves and spirit trees that have particular significance for indigenous minority groups such as the Kuy. In addition, forests such as Prey Long provide important watershed management services to Cambodia’s rural population by regulating the water flow in agricultural areas.

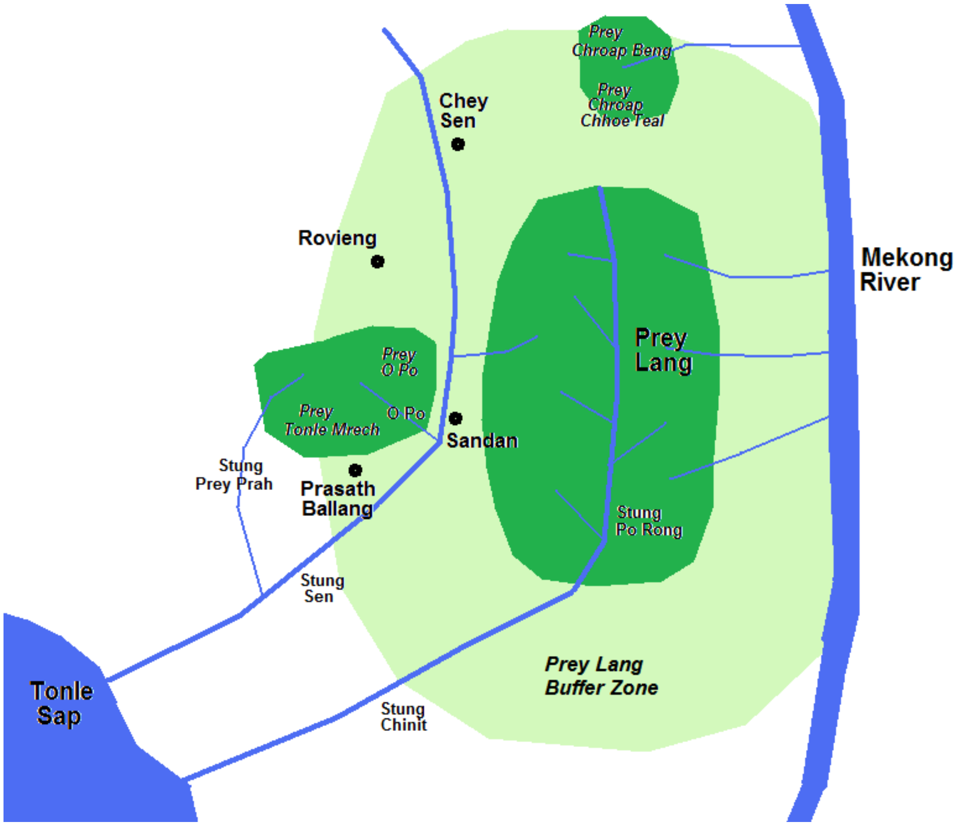
The new agreements with Kuwait will require the use of all of the Prey Long and watershed areas of Stung Sen and Stung Chinit if food for Kuwait is to be produced in Cambodia. Many experts feel that Kuwait will need around 4 million ha of land – far greater numbers than the 130,000 ha mentioned in previous discussions.

The watershed area has faced threats before. In their report in 2009, the East West Management Institutes (EWMI) described how tens of thousand of trees were logged in the 1990s by companies such as Meng Ly Heng, Colexim, and Timas. Some of those trees had existed before the days of Angkor Wat and where almost three arm spans or 500 cm in girth. The logging was discontinued in 2002 and Meng Ly Heng's concession was cancelled due largely to the anti-logging efforts of local communities and increased taxes.

During the rainy season, water flows into Tonle Sap Lake from Stung Sen and Stung Po Rong (the watershed are of Stung Chinit) making the area important in managing the water in the Tonle Sap Lake at the very heart of Cambodia.

During the 2008 visit, the researcher observed the controversial practices of electro-fishing and fine net usage throughout the region. Seine and permanent gill nets were also used in the Stung Sen River during the dry season. Almost every villager in the Stung Sen River area is involved with fishing in some form or other and therefore, the continued decrease of fish populations observed all along the Stung Sen River affects everyone. Medium and commercial fishers have been asked to purchase licenses to operate legally. Each license can run up to US$1,000 per person, which puts additional strain on the people in this area. Fish equipments include floating fishing net and seine net putting along the river and some places across the river.

Figure 2: Map illustrating the watershed of Stung Sen and Stung Chinit tributaries



Gold mining began at the mouth of the Stung Chinit watershed in 2006. Villagers in Rovieng have traditionally panned for gold for years and villagers in Phnom Chi began panning for gold in the 1980's. Eventually, businesses began to mine for gold in these two areas and introduced the use of chemicals to the process. This resulted in the poisoning of streams and has had severe impacts on animals and people alike; nearly 100 cattle have died. Now, foreign companies have been given permission to mine in both of these areas and are expected to begin large-scale operations in the near future. The local Kuy people have been known historically for their iron production, which they practiced until 1970. Chinese and Korean companies have begun to explore for iron ore in Rovieng and Chey Sen districts. Iron mining is only done on a large scale in most countries because it is otherwise unprofitable. Greater resource depletion in these areas is of great concern to local people and the nation as a whole.

In late September to early October 2009, the province was one of the worst hit by Ketsana typhoon on those areas associated with Stung Sen River. Interviewed with provincial, local authorities and local communities showed the Ketsana affect 45,989 ha of paddies with 13,451 ha recover while 20,753 ha were complete destroyed (with total cost of US$8,820,025). Loss of other productive assets for local communities are reported to be US$190,525. The combination of typhoon and torrential rain affected 447/738 villages from all districts, destroyed 109 houses, 428 roofs house destroyed and 5 were partially destroyed with 33,687 families affected and 16,990 families become vulnerable, 20 people reported death and 45 injured. This put more pressure on food security and irrigation development along the stream.

B) Downstream Watershed

Various national institutions (including CNMC, MOE, and MAFF) have designated the lower areas of the streams as the Stung Sen Core Area of Tonle Sap[xvi]. This area covers 6,355 ha. This area is believed to support more than 300 species of invertebrates, 210 species of birds, more than 170 fish species, more than 30 species of reptiles, 20 species of mammals and 5 species of amphibians (MoE, 2008). The Stung Sen Core Area has been acknowledged as a vital area for biological research, ecotourism, cultural importance, and educational and economic value. With the help of this designation and recognition, the conservation and restoration of this important ecosystem is hopeful. Threats still remain, however, as illegal fishing and other threats include the mining and conversion of forest in the form of economic land concession to the local fishing lots continue to be reported during most of the year.

Expansion and Decision-making Methods in Irrigation Development

Numerous discussions and interviews at the provincial level have shown that the most commonly cited rationale for expanding irrigation development in Cambodia is the improvement of livelihoods among the rural poor. This section of the report will discuss the decision-making methods at various levels as well as consider various influences and other factors in hopes of clarifying how decisions are made and how they affect the countries natural resources.

Decision-making Mechanisms

A) At the Bilateral Level

Top leaders from both Cambodia and Kuwait attended exchange visits to promote bilateral aid and diplomacy relations, which included opening an official embassy in the country. During the official visit to Kuwait from January 13-15, 2009, the Cambodian Prime Minister presented a speech during the welcome dinner at the Kuwait Prime Minister’s house.

The speech read[xvii]:

“This evening, his Excellency the Prime Minister and I discussed and exchanged views on bilateral relations as well as regional and international issues in a very cordial atmosphere and with extensive mutual understanding. We agree to have four documents signed, namely:

- Agreement on Air Service
- MOU on the Field of Exchange of Manpower
- Agreement on Tourism Cooperation
- MOU on the Implementing the Development Project in the Stung Sen River Basin in addition to the seven documents previously signed in August of last year.

B) At the National Level

The Cambodian Prime Minister hopes that these documents will foster mutually beneficial cooperative efforts between Kuwait and Cambodia in the areas of tourism, development, and economic trade.

At the national level, the Council of Ministers - or the cabinet - is the country's top executive agency, and it facilitates and guides the activities of individual ministries and local agencies. It is chaired by the Prime Minister with two Deputy Prime Ministers serving as vice chairpersons. There are currently 207 ministers and secretaries of state from 25 individual ministry departments, which include the ten current Deputy Prime Ministers. The Prime Minister has the power of chairman on the Council of Ministers and as well as most other national councils and committees. To facilitate the development of external development partnerships and technical assistance opportunities, the government has formed various national development councils including the Council for Development of Cambodia. There are currently 18 working groups based on sector development approaches. One of the technical working groups focuses on agriculture and water development and is co-chaired by MAFF and MOWRAM with co-facilitation efforts from various external development agencies.

C) Council for Development of Cambodia (CDC)

The CDC is also chaired by Prime Minister Hun Sen. The first deputy of the CDC is the Deputy Prime Minister and the Minister of Economic and Finance while the Senior Minister and Minister of Commerce acts as the second deputy of the CDC. The deputy secretary general is the current senior minister Sun Chanthol, former Minister of Public Work and Transportation.

The council is divided into three boards:

- Cambodia Rehabilitation and Development Board (CRDB) deals with all Official Development Assistance (ODA) including grants and bilateral aid
- Investments Board deals with the private sectors which include special economic zones, investments, FDI, Domestic Investment, and regulatory framework
- Special Economic Zones Board which oversees the 4 special economic zones in operation, the 2 which are being built, the 21 which have been approved, one single window import/export procedures, and infrastructure development

Investors who wish to avoid the criteria and complexity of the ministries often apply directly to the office of the Council of Ministers or the Cabinet of the Prime Minister. Their letter of recommendation then goes down to the CDC for discussion. The CDC consists of many ministries including MINE, MOWRAM, MAFF, MEF, and other related ministries. The CDC meetings will often approve a decision with suggestions to have correction and changes.

As of 2009, approved investments by country and sectors (1994-2008) under components 2 and 3 had reached US$15,258 million. China leads investments with $6,132 million followed by South Korea with $2,740 million. Malaysia has invested $2,199 million, and the USA comes fourth with $1,178 million. The EU is next with $1,060 million. Singapore has invested $326 million, Taiwan has $636 million invested, Hong Kong has $274 million, Thailand invested $570 million, and Japan completes the list with $143 million worth of investments. Total investments were shared among four major sectors: 1) Tourism - 50%; 2) Service 23%; 3) Industry - 2%; and 4) Agriculture - 5% (Chanthol, 2009[xviii]).

D) Technical Working Groups

To facilitate and coordinate development projects and assistance in Cambodia, a sub-decree in 2004 was established 18 technical working groups. The Technical Working Group on Agriculture and Water (TWGAW) is co-chaired by MAFF and MOWRAM. These technical working groups also receive technical support from various donors working in the sectors. The goal of the groups is to coordinate the ongoing projects within a sector. In the agriculture and water sector, there are five existing programs that need to be correlated to form one comprehensive program. The significant funding required to coordinate and implement this comprehensive program is expected to come from grants and loans received from external development agencies. According to recent reports, the Chinese and Kuwaiti investments are not integrated to the technical working groups as they work directly with top government officials.

Decision-making at the Ground Level

The responsibility for irrigation construction is directly proportionate to the funding available to the level of authority in question. For example, the provincial level is responsible for construction schemes with a total budget up to US$50,000. The national level is responsible for projects with budgets above $50,000. This criteria and division of responsibility creates many problems during implementation. In addition, information sharing between national level officials and provincial level officials is almost nonexistent. Personal interviews with various stakeholders at the provincial level revealed that little or no explanation is given for how or why certain development schemes are chosen.

Case 1: The Decision-making Process for the Proposed Stung Sen Irrigation Scheme

During an interview on December 4, 2008, the Provincial Director of Environment provided the following motives for choosing the Stung Sen River for large-scale irrigation development.

The national Cambodian government is within its rights to construct irrigation where it sees relevance. The Provincial Director had no objections to the national level decision. The province has a large amount of cultivated areas – during the wet season, the floodplain in Tonle Sap Lake area is between 50,000 to 70,000 ha. During dry season, this area has no water for rice cultivation while there is an overabundance during the wet season. Adequate irrigation and storage systems would provide consistent irrigation year round.

The irrigation scheme could provide much needed food stability in the province. As the population of the province nears 1 million people, modern agricultural systems are necessary to replace the antiquated conventional methods.

More farmers are becoming dependant solely on this area for their rice cultivation needs. Fewer farmers are going upstream to cut forest and cultivate rice production and many have stopped cultivating floating rice during the wet season.

During an additional interview with a provincial NGO activist, it was revealed that the Stung Sen is considered the main source of fish ecology and fish migration because of its strong hydrological flows. Upstream, the forest provides many wildlife sanctuaries. The stream catchment system could provide a large quantity of water that would be ideal for irrigation and hydropower, and there is a large amount of arable land that could be converted from floating rice cultivation to recession rice practices. The NGO activist noted that the provincial governor encouraged the change from floating rice to recession rice practices during 2005 – 2006 to support the idea of exporting rice to Kuwait, which resulted in a greater need for irrigation during the dry season (Interview with Mr. Iem Chanrith, former officer of FACT, December 5, 2008).

Other interviews with provincial departments of water, agriculture, mining, energy, and industry revealed that many officials were not clear on schemes development or implementation. Several departments knew only that the construction would take place on the river. Villagers living along the upper areas of the river reported that they were initially consulted about the irrigation scheme but they had no detailed information as the project is in the early stages.

Case 2: The Decision-making Process for the Stung Chinit Irrigation Scheme

The Stung Chinit Irrigation renovation can be traced back to the early 1990's when The Asian Development Bank (ADB) approved the Special Rehabilitation Assistance Loan (SRAL) for emergency rehabilitation of infrastructure, which included some irrigation systems. During preparation of the SRAL, it became clear that there was interest in additional investments for irrigation development (ADB 2000) and that the Stung Chinit area was one of the priority candidates for these investments. The first feasibility study was conducted by an ADB expert in the mid-1990's. Due to continued insecurity and civil unrest in the area, the expert was unable to produce sufficient information to justify the overall investment of the scheme.

In 1999, GRET/CEDAC was commissioned by AFD to conduct an additional/ complementary feasibility study. The study focused on three components:

- Agricultural productivity and improvement. This sector showed that 85% of people interviewed were willing to support the irrigation scheme. People living upstream were particularly supportive while those living downstream were less supportive In addition, the technical team from MOWRAM who came to conduct a study on resettlement and land impacts had taken that opportunity to buy land in the area where they knew the irrigation construction would take place.
- Institutional support towards the FWUC creation.
- Testing underground water as an alternative to irrigation development. This test, which was conducted in and around 30 villages in the area, showed that groundwater was not a viable alternative method to irrigate the paddy fields.

According to CEDAC research team members who were involved in the socio-economic survey before the start of the project, both provincial and ministerial officials suggested that the research team focus on the irrigation need of farmers, especially for the dry season rice, in the specified area and the province as a whole. Team members also recalled that villagers still used irrigation up to 1986 but most of the major areas did not have water. The study showed that around 85% of the villagers interviewed were willing to have the irrigation scheme renovated based on the existing model of the Khmer Rouge[xix] and would be willing to pay an irrigation fee. It should be noted that during the time of the study, areas in the province were still unsafe because of the existing Khmer Rough soldiers whose presence made villagers hesitant to move upstream to cut wood.

However, after improvements were made on the roads[xx] and the safety issues were resolved upstream, many villagers began to migrate upstream for woodcutting and shifting cultivation. Most villagers living in the focus area began borrowing money from middlemen in the markets to spend on woodcutting. They spent around three days per trip and the profits they gained from selling the wood went back to partially paying their debts. This activity was illegal and many of the villagers were fined by the forestry administration and the police checkpoints among the roads.

Political Drivers: Issues of Origins

The way on how decision is made is strongly influenced by political interest and actor involved. There have been trends for politicians from the birthplace and origins to patronage people support from their place. Personal observation revealed that at minister level, they need to stand for election in one district, which is mostly the place they are from. If they lost election at the place they are from, this means their position has been insecure as well. Based on this logic, many times, technical expertise and assistance has to be used to fulfill politically driven requirements. Some politicians listen to advice from technical experts but others see these experts as merely tools to use to accomplish their personal projects.

Interviews with Development Officers working on the Stung Chinit Irrigation Scheme since 2001 revealed that the project promotion was influenced by such national political actors as: the current Minister of Tourism, whose homeland is situated in Baray district; the National Bank Governor, whose house is located along the Stung Taing Krasaing stream in Santuk district; and the current First Deputy President of the National Assembly. These are the main human resources of the CPP party who are in charge of the districts and provinces in the political patronage system. Another important actor at the provincial level is the current District Chief of Santuk, who is very active in mobilizing people toward development and forming working groups at the grassroots levels.

Lessons Learned from Project Participation

In late 2008, farmers from 15 out of 25 villages were surveyed on their willingness to conduct dry season rice cultivation. The majorities of the farmers either refused to participate or were unable to cultivate during the dry season because of the following reasons:

- They were busy with their lower areas of rice cultivation (Rice cultivation in the Tonle Sap floodplain is sometimes known as recession rice cultivation during the dry season).
- The cultivated areas were far from their homes.
- Farmers are busy with upstream woodcutting and selling.
- Farmers are busy with livestock care for cattle and buffalo.
- Some villagers were busy climbing palm trees to produce palm sugar.
- Farmers were busy clearing new land upstream (outside command areas). Since October to December 2009 and will continues, many villagers in Kraya of Santuk district have been arrested by local polices and authorities as they protest against the economic land concession granted by government to large-scale agro-industrial. The concession also overlaps with their current farming and residential land. No clear solution had been made during the writing.
- Farmers previous experience with the dry rice cultivation in the focus areas were of little benefit to them economically. The investments did not provide a return.
- Villagers complained that dry season rice cultivation makes their paddy field waterlogged and results in more grass and weed growth.
- They find it difficult to plough during the wet rice season.
- Traditionally, most cattle and buffalo are released during the dry season and it is difficult to work and feed these animals during the dry season.

- Pest pressure was prevalent in the dry season.

For these reasons, the push for local farmers to invest their labor and capital in dry season rice cultivation was discontinued.

Another concern was that the irrigation scheme did not respond to the needs of the local people. Research by GRET/CEDAC staff working with the project reported that:

Local villagers did request the construction companies - both foreign and local - to adjust the scheme based on requests from local farmers, but the companies did not listen to their complaint and based their decisions on knowledge collected by technical experts. Most of the construction companies belonged to MOWRAM so that the same people when dealing with the local farmers played both the roles of constructers and officials. Therefore, most of irrigation scheme were not good quality or efficient designs. (Interview, September 16, 2009).

The CEDAC team who worked in Stung Chinit observed that there were conflicting ideas on the need for irrigation between the local farmers and the government. The villagers had hoped for a partial irrigation system that would work in conjunction with the wet season irrigation already in use. The government, however, decided to develop a large and complex system of irrigation canals. This top-down decision-making process tends to support large, modern irrigations schemes without taking into account the lack of capacity to manage and operate these schemes at the local level. MOWRAM has often complained about the lack of human resources and capacity at the provincial level.

In addition, the establishment and recognition of the FWUC took place around 6 years to get official recognition from MOWRAM. It was suggested that this process should be done at the provincial level including the responsibility to properly allocate funds and to create a better business environment for the private sector and civil society. The national level should play a role at the macro level advocating and coordination with the EIA. Meanwhile, future efforts should be made to research and reflect on the ability of local partners to manage the schemes and operate the irrigation systems as mentioned in the PIMD guideline. According to the PIMD guideline, the government will subsidize five years of operation before the transferring control to the local farmers. To date, this practice has not been applied, resulting fewer benefits from the irrigation scheme in the dry season.

Land reallocation in Stung Chinit is considered a success despite the confusion of local farmers at the onset of the project. The concept of the land reallocation was to justify the land lost by sharing and regrouping those plots of land closest to the irrigation canals of each block. This practice took longer than expected as some farmers had up to five different plots of land and some blocks were shared by seven different villages.

A summary of the lessons learned from the Stung Chinit Irrigation scheme is listed below.

1. Irrigation development proponents should consider the actual needs and interests of the local farmers as well as the livelihood and rice dependency of these farmers.. The need for crop system diversification is evident. In the case of Stung Chinit, farmers depend not only on rice but also on small-scale watermelon and other cropping systems.
2. The priority of irrigation development is to provide complementary irrigation to ensure the stability and high productivity of rice harvest in the wet season. Developing irrigation for the purpose of two to three rice crops should be secondary due to the soil conditions in many parts of Cambodia.

3. Officials need to decide on the type of irrigation scheme based on geographical and hydrological factors. Consideration must be given not only to the type of irrigation scheme but also the nature of the local farmers and their willingness to participate in collective action or CPRs that are often require by irrigation schemes. The case from Stung Chinit will require farmers to develop planning; participate in discussions and negotiations; and act more independently once the project has completed its mandates. The experiences of GRET/CEDAC suggested that the schemes should range from 100 to 1000 ha with fewer villages involved (using hydrological boundaries). The more villages that are involved, the more problems that occur as villagers become less willing to contribute. Fewer villages mean less political boundaries and better in organizing collective action. Yet donors have a preference for large-scale schemes (as shown by the case of Kuwait)
4. The capacity of the community as well as the local government agencies to operate and maintain the systems needs to be taken into consideration. The larger the scheme the more capacity required.
5. To be operational, the irrigation scheme requires support from local authorities to solve problems and collect water fees. Other provincial departments are needed to show collaboration and support for the scheme such as PDOWRAM, PDA, Provincial Department of Environment and Police officers.

Decision-making Tools

In principle, the environmental process assessment requirements related to agricultural and irrigation development project must apply.

The interview with the Provincial Department of Environment revealed hat EIA and SIA are needed but the main goal of irrigation development is to improve the livelihoods of the local people. The consequential impacts of large-scale irrigation construction would not last for long. Therefore, EIA will not be needed until later on. The Department of Environment official proposed two things to be considered:

The feasibility study must focus on current natural resource status (resource valuation or Payment Ecosystem Services). Expanding the irrigation systems will require additional water and rice production. Other production to be considered includes aquatic resources, biodiversity, and ecology, which are the main source of livelihoods. Fish does not provide 100% of the protein needs to the people in the province but it does provide a large amount (Currently, fish accounts for about 50-60% of protein intake.). The fish quantity will be reduced due to the irrigation reservoir expansion for recession irrigation in the floodplain, which involves more intensive pesticides and chemical usage. Currently, there is only one fishing lot along the Stung Sen tributary.

Large-scale irrigation development must be able to balance the loss and benefit. The proposed water diversions across the rivers with many irrigation scheme along it will be inevitably change the flow of water including other resource such as aquatic, fish, and flood forest. Agricultural practice will change from conventional to modern methods, seasonal cow and buffalo raising in dry season flood plain as well as farmer seasonal resettlement for farming will also changes.

This interview showed the need for a complete, full-length feasibility study in order to formulate the correct project master plan. It was also suggested that there be more consultations with local communities including line institutions. Meanwhile each institution should prepare a detailed report and study describing their skills and responsibilities during and after implementation of the scheme and present the report and findings of the feasibility report at form workshop for the villagers in the focus area.

According to EIA guidelines, the Provincial Environmental Development agency (DOE) is responsible obtaining IEIA approval on all projects costing less than $2 million USD. Projects with a budget surpassing $2 million USD must be reviewed and approved directly by MOE central.

IEIA and EIA requirements vary from sector to sector. For the irrigation sector, IEIA or EIA is required for projects covering or affecting more than 5,000 ha. (A detailed list of IEIA and EIA requirements is listed in Table 3.)

Table 3: IEIA and EIA Requirements for Agriculture-related Projects

Project Type and Associated Activities		Size/Capacities
1. Agriculture		
i	Forest concessions	> 10,000 ha
ii	Logging	>500 ha
iii	Land covered by forest	> 500 ha
iv	Agricultural and agro-industrial land	> 10,000 ha
v	Flooded and coastal forests	Any size
vi	Irrigation systems	> 5,000 ha
vii	Drainage systems	> 5,000 ha
vii	Fishing ports	Any size
2. Agriculture-related Projects		
i	Food processing and canned goods	> 500 tons/year
ii	All fruit drink manufacturing	> 1,500 liters/day
iii	Fruit manufacturing	> 500 ton/year
iv	Orange juice manufacturing	Any size
v	Sugar refining	> 3,000 ton/year
vi	Rice mills and cereal grains	> 3,000 ton/year
vii	Chemical fertilizer plants	> 10,000
viii	Pesticide industries	Any size
ix	Animal food processing	> 10,000 ton/year

Source: MoE (1999): Annex of sub-decree on EIA process

In the case of Stung Chinit, scenarios where developed after the operation was fully functional with the assistance of a French expert. Developing different scenarios and applying IMT models can predict the sustainability of a scheme. Sustainability cannot be achieved unless the government follows through with their financial commitments for maintaining the schemes as stated in the policies they developed on sustainable irrigation management.

A cost-benefit analysis was applied to Stung Chinit irrigation scheme but it failed to predict the reality of the situation. One of the most contested issues is that the scheme coverage has been reduced while the financial expenses continue to increase including prolonged construction and operational expenses due to poor coordination among the key stakeholders. Fish pass monitoring and migration research have been done but with no follow up. Currently, the fishery communities and the fish pass monitoring have failed to be fully functional.

Conclusions

The Cambodian irrigation and water sectors have generated increasing interest among large-scale investors, particularly the areas surrounding Tonle Sap Lake and the Mekong Floodplain. However, there has been little success in the selection of, and support for, the current decision-making process.

Even though the rationale to build large-scale irrigation remains a high priority among senior government officials, it is difficult to understand why the government wishes to expand the new schemes as there are many schemes that are not working. It seems that they are not learning from the past mistakes. There is no consultation with stakeholders, include also inside the government. The first preliminary observation made by the study reveals that there are huge amounts of money being poured into the farming sector. Meanwhile the selected target provinces often are the places where key political actors or decision makers reside and attract these projects using their political connections.

Many of the tools available to improve the decision-making process have not been used. This is partly due to a lack of technical knowledge, partly due to an overtly zealous desire to compete with neighboring countries, and also to the political nature of most projects. The government has used this competitive desire to justify ignoring the tools available.

In addition, public consultations concerning the project development and planning among local stakeholders remain weak. The experiences and observations from the Stung Chinit Irrigation Scheme suggest that irrigation proponents need to consider the actual needs and interests of the local farmers as well as their overall livelihood dependency on rice cultivation versus off-farm activities. Before a large-scale scheme is implemented, alternatives need to be explored based on geographical and hydrological components. At the local level, there should be discussions about whether the farmers' livelihoods support the need for irrigation systems, what potential cropping systems are available and whether the community is open to collective action.

Because of the increasing investments and grants in the agricultural sector, good governance and transparency are increasingly important. There should be a third professional party who helps to implement the work at certain levels with the financial support of the development partners. For instance, the PDOWRAM and the Irrigation Service Center implemented by GRET/CEDAC and financed by AFD could provide technical assistance to farmers through agricultural extension, demonstrations and scheme construction. Direct investments to small-scale farmers in the form of loans should be considered as a viable way to generate employment. For example, if loans of US$100 to $200 were given to 2.6 million families, the total amount of reinvestment and growth would be significant.

Organizational and leadership development between FWUC and the O&M needs to take place early in the development stages or the schemes are likely to collapse. More farmers should be trained on water harvesting techniques, particularly in those areas at the watershed level.

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[i] It is a political platform and economic action agenda **for growth, employment, equity and efficiency**. Key elements of implementation are selected from Cambodia Socio-Economic Development Program, Cambodia National Poverty Reduction Strategy, and the various policies, strategies, plans and other important reform programs. To achieve these, the government appeals to all development partners including the donor community, the private sector, non-governmental organizations, civil society, and officials, civil servants in all ministries/institutions, members of the legislative executive and juridical branches, members of the armed force, the authorities at all levels and each and every citizen to provide all necessary support, as well as actively participate, in partnership with the RGC.

[ii] The Cambodia Daily Newspaper, "Cash Crop? The Push To Maximize Cambodia's Rice Potential: the Field of Dreams", October 18-19, 2008.

[iii] Provisional Population Totals, 2008 Census, February 2009. http://www.nis.gov.kh/index.php/statistics/surveys/census2008/provisional-population-totals?dc536d60b52b950803b9c8b3b236d526=0f979183f773b7f7fe27a68a52bf9b78

[iv] Total rice product is 7,175,473 tons of which 13% is seed and post harvested losses (932,811 tons)**.** Remaining paddy rice for consumption is 6,242,662 tons. After converting into milled rice (64% loss), 3,995,303 tons remains of which 1,970,270 are required for domestic consumption.

[v] Council for Agriculture and Rural Development, "Strategic Framework for Food Security and Nutrition in Cambodia 2008-2012." May 2008, p. 9

[vi] Eastern provinces refer to those situated on the east side of Mekong River in Cambodia which includes: Svay Rieng, Prey Veng, Kampong Cham, Kratie, Stung Treng, Ratnakiri and Mondulkiri provinces.

[vii] Official CAVAC document in December 2008 showed five year project period starting from 2009-2014 covering Kampong Thom, Takeo and Kampot provinces. Total fund are AU$43.262 million (around US$40 million) divided into five components: (i) agribussiness Development with AU$ 4.846 million, (ii) Water Management with AU$ 9.366 million, (iii) Research and Extension with AU$ 5.227 million, (iv) Business Enabling with AU$ 2.637 million and (v) program management with AU$20.186 million. The document proves that the Cambodian government will be making in-kind contribution to program implementation through the capacity and commitment of MAFF, MOWRAM, PDAs, PDWRAMs, and the various government-funded organisations such as CARDI that will be involved in R&D.

[viii] Eastern provinces refer to those provinces on east side of Mekong river in Cambodia which include: Svay Rieng, Prey Veng, Kampong Cham, Kratie, Stung Treng, Ratnakiri and Mondulkiri provinces.

[ix] See ADB project document in June 2009 on Report and Recommendation of the president to the Board Directors under the project title "Proposed Loan and Asian Development Fund Grant: Kingdom of Cambodia: Tonle Sap Poverty Reduction and Smallholder Development Project"

[x] By definition, small-scale irrigation projects cover an irrigated area of less than 200 ha. The Deputy Prime Minister might not be aware of the scale classification made by MOWRAM.

[xi] Personal interview with Mr. Cheng Sarouen occurred on September 25, 2009. He is now working as the technical advisor to the Northwest Irrigation Projects as the irrigation engineering specialist.

[xii] See Narong, Hang Chuon (2008) Cambodia: Recent Macro-economic and financial sector development. Supreme National Economic Council (SNEC), Phnom Penh, Cambodia.

[xiii] Personal interview with H.E Veng Sakhon, Secretary of State, MOWRAM. August 24, 2009.

[xiv] Small scale cover an areas with less than 200 ha, medium scale range from 200 ha to 5,000 ha while big scale covers an area bigger than 5,000 ha.

[xv] See Kampuchea Thmey Daily Newspapers dated September 23, 2009.

[xvi] In Tonle Sap Lake there are three core areas: Prek Toal Core Area, located in Battambang Province, covers an area of 21,341 ha; Boeng Tonle Chmar Core Area covers an area of 14,560 ha; and Stung Sen Core Area, located in Kampong Thom, covers an area of 6,355 ha and is associated with the Stung Sen River/Tributary.

[xvii] For further details, please see TOAST of Samdech Akka Moha Sena Padei Techo HUN SEN, Prime Minister of the Kingdom of Cambodia at the dinner hosted by His Excellency Sheikh Nasser Al-Mohammed Al-Ahmed Al-Jaber Al-Sabah, Prime Minister of the State of Kuwait, in honor of the Cambodian Delegation (http://www.cambodia.gov.kh/unisql1/egov/english/home.view.html.

[xviii] Chanthol Sun, Senior Minister and Vice Chairman of Council for the Development of Cambodia, "Why Do business in Cambodia?" 2009.

[xix] The renovation was not as complicated and modern as it is today.

[xx] Rural road construction was completed in Stung Chinit in 2008. However, signboards were posted reading that completion took place in 2006 to justify the poor quality of the roads. Some villagers destroyed those signboards to show their disgust with the construction company. Most of the rural roads in Stung Chinit were still very dilapidated as of 2009.

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Governing ecosystem services from upland watersheds in Southeast Asia

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Introduction*

The ecosystem services derived from upland watersheds are important to the well-being of people living in them, others living downstream and to society more widely (Millennium Ecosystem Assessment 2005, Braumann et al. 2007, Lebel et al. 2008). Perceived or realized services often include providing food, timber, fuel-wood and non-timber products, pollination and pest control for crops, water for irrigation or hydropower, sites for cultural activities, flood protection, buffered base flows, carbon sequestration and water filtration. The specific benefits people

* Contribution to the Global Land Project Book on “Vulnerability and resilience of land-use systems” edited by Ademola Braimoh.

obtain from a watershed are highly dependent on the mixture of ecosystems present, landscape structure and social contexts.

As a consequence of this variety of valued services pursuing multiple management objectives is a practical reality for most upland watersheds in Southeast Asia. It is also a source of contestation and conflict. Managing a watershed for one particular service or user may result in trade-offs in provision of other services and for other actors. Local communities and governments have frequently tried to prioritize, eliminate or integrate use of different services with combinations of plans, rules, incentives and information (Lebel and Daniel 2009).

Spatial planning has been the favoured approach. Governments have devised classifications for land, forests and watershed and used these to restrict or encourage particular activities (Laungaramsri 2000). Upland communities have also made spatial plans, but with typically more flexible and overlapping systems of rights for using different resources – that is, with a less strictly territorial perspective.

An important adjunct of plans is to associate landscape units with rules of use and responsibilities. Rule-making can be by, or in consultation with, users or it can be dictated by more remote authorities. Co-management models have often been promoted because they provide opportunities to consider services valued at different levels.

Although many rules are do’s and don’ts, alternatives that create incentives may be more effective in some situations (Wunder 2007). Markets for ecosystem services have been established in various parts of the world as an alternative to regulations to encourage conservation of valued services. Their performance depends on institutional design details and socio-political contexts (Wunder et al. 2008b).

The quality of information about services and impacts of use and management is crucial to most efforts at governing them but often receives insufficient attention (Carpenter et al. 2009). Payments for ecosystem services, for example, require a good understanding of which actions actually secure provisioning and indicators that can be monitored (Engel et al. 2008). In many cases unambiguous, place-specific, evidence that particular land-covers provide a service is lacking – for example, flood protection benefits (Bruijnzeel 2004, Locatelli and Vignola 2009, van Dijk et al. 2009). Local, experience-based knowledge, and scientific knowledge are not as frequently integrated as needed (Berkes 2009). Building awareness and understanding through integrated assessments and monitoring are crucial (Lele 2009) but will never be a substitute for politics around which services and users should be prioritized.

In this paper we deepen an earlier short review (Lebel and Daniel 2009) with a more focussed analysis of experiences in the southeast Asia region. We remain interested in both institutional and political dimensions of governing ecosystem services from upland watersheds. The rest of this chapter is organized around the three themes of plans, rules, incentives and information.

Plans

A common approach to managing the complex set of services from upland watersheds is through spatial land-use planning, zoning some areas for biodiversity conservation, watershed protection, forestry, agriculture, tourism or multiple uses. Most governments in south-east Asia have adopted policies for controlling land-use in upland watersheds. The extent to which users and residents are involved in planning varies as does the influence of plans on practices.

Protected areas

Most conservation policies and strategies of governments are founded on the idea of separating people from their environments in systems of protected areas (Chopra et al. 2005). A discourse around the benefits of ecosystem services has usually been added to early justifications based on biodiversity and recreational or cultural values, focussing on either downstream communities or more recently on global environmental benefits of reduced deforestation. The protected area approach argues that conserving natural ecosystems in a close to intact state will maintain a full suite of ecosystem processes, and thus, the full range of services, which forests or other forms of native vegetation provide.

Vast areas of the tropics were declared as protected areas between 1980 and 2005 (Naughton-Treves et al. 2005). Indonesia has set aside about 12.5 % of its land area in protected areas for nature conservation; Malaysia about 31% (EarthTrends 2003, UNEP-WCMC 2003); Thailand about 19% percent for conservation (ICEM 2003c, IUCN 2007). The practice of allocating large areas as conservation areas and parks has spread in the 1990s to other countries in the Mekong region. Lao PDR has established an extensive set of protected areas covering more than 21 % (ICEM 2003a) and Cambodia 18% (ICEM 2003b). While most protected are located in the uplands (as lowland areas have already been cleared of native vegetation) the extent to which use of forest goods and services is restricted varies among countries (Thomas et al. 2008). The effectiveness of management also varies widely with many parks existing only on paper, promised local benefits to residents from tourism often smaller than expected, and conflicts created over access to land, resources and services (Roth 2004a, Naughton-Treves et al. 2005).

As of 2008, Thailand's Royal Forestry Department had established more than 200 protected area units covering approximately 19% of the country's land area. The government of Thailand intends to increase protected area systems to 30% of the country in 2016 (Trisurat and Pattanavibool 2008). The implications for the upland communities, particularly ethnic peoples, living and farming in protected areas declared as national parks, wildlife sanctuaries and watershed areas are huge and tensions involving farming communities fighting state forest land classification have become increasingly frequent (Wittayapak 1996, Poffenberger 1999). At larger scales the outstanding challenge is that benefits from existence value of biodiversity frequently do not align with the value of habitat conversion to agriculture for local poor communities (Fisher and Christopher 2007).

However, parks have failed at forest conservation; special deals are possible to convert land for tourism and even personal use. In Thailand's Khao Yai National Park, a proposed golf course and resort that began construction was halted only after protests (Laungaramsri 2002a, Ross 2003). Powerful military or political figures can acquire "protected" areas or land designated for resettlement of displaced villagers but typically remain un-investigated (Phongpaichit 1999).

Studies of a biodiversity conservation in Ruteng Park on Flores Island in Indonesia provides a closer look at the links between the conservation of biodiversity and the livelihoods of rural people who live on the fringes of the parks and protected areas. An early study demonstrated the economic value of drought mitigation services to farmers downstream of forest in upland watersheds inline with policies of the Indonesian government and park (Pattanayak and Kramer 2001). A subsequent study linked forest cover to prevalence of diarrhoea presumably through impacts on drinking water quality illustrating another under-appreciated service of the park (Pattanayak 2007). Parks can provide multiple ecosystem services and benefits.

Forest and watershed classifications

Control and authority over forest areas of most countries in Southeast Asia rests with the national or state government. In Indonesia, the Philippines and Thailand, state control over forests has grown since the establishment of forest service agencies during the late 19th and early 20th centuries. Governments have exerted authority over forests through land classification and zoning schemes, for example, by attaching regulations prohibit local access or use depending on whether a parcel of land is classified as “forest” or “upland” (Lebel et al. 2004).

In Thailand forests are defined by the 1941 Forestry Act as “*land without occupants*” and as “*land with no right-holders*” (Forestry Act 1941). As land areas become classified as ‘*forest reserves*’, there is a great deal of ambiguity of ownership of agricultural lands in rural areas particularly in collectively-used lands such as community forests, sacred forests, and fallow farmlands (Sato 2003). Agricultural land in forest reserves make up the majority of agricultural lands in Thailand in areas typically classified as degraded forests. Only a minority of private land holdings used for agriculture have full title deeds. Often agricultural land holdings do not have the concept of ownership in the modern sense and are limited to either usufruct or *‘sithi krobkrong’* and squatter’s rights or ‘*sitthi japjong’* (Sato 2003). The changes made to legal categories and procedures for land over the past several decades are an important source of contemporary conflicts over land. The current legal categories of rural and forest land in Thailand illustrate some of the governance problems created by categories and definitions driven by interests in a narrowly framed set of services.

The National Forest Reserve Act of 1964 attempted to centralize forest control; by 1985, the RFD declared approximately 45 percent of the country’s total area as forest reserves. But lands designated as state national forest reserve often had no trees or already had people residing in those areas (Hirsch and Lohmann 1989, Flaherty and Jengjalern 1995).

The RFD’s designation of forests as being driven by the expansion or maintenance of its own power and control over territory (Vandergeest and Peluso 1995) does not completely explain official motives but may also include departmental factionalism. For example, designation of reserved forests before 1938 that was undertaken by the authority of local administrative sections could not realistically expand the authority of RFD. Some regional forest officers enthusiastically urged the designation of reserved forests at that time because they thought if they did not do so, the forests would disappear. Thailand’s foresters were also conscious of the need for spatial enclosure of forest lands for so-called scientific forestry (Wataru 2003).

Other Mekong region countries follow systems similar to that of Thailand with the difficulty that the state spatial classification system finds it unable to incorporate other types of land-uses such as swidden systems.

Swidden areas are a mosaic of different-year fallows and secondary forest areas some of which subsequently also are transformed into upland rice fields and then back again into fallows. Fallow forests that are part of the swidden rice cultivation cycle of upland communities cover large parts of Burma/Myanmar, Cambodia, northern Thailand, Lao PDR and Vietnam. Secondary forests, which regenerate on the fallow swiddens, are rich in tree species and complex with respect to stand structure. The farm-forest fallow-swidden ecosystem (including the trees and wildlife species) is part of an extensive indigenous knowledge system. But as swidden cultivation is actively discouraged by officials, the system is undergoing many changes and also increasingly being replaced by permanent rice farming. The land use changes are causing a reduction in the area covered by fallow forest ecosystem with subsequent negative impacts on biodiversity (Rerkasem et al. 1994, Schmidt-Vogt 1998, Laungaramsri 2002b, Walker 2004).

State management uses positionality to make strictly bounded static spatial categories such as “conservation forest” and “village land”. Categories of this type can be easily delimited on a map and made legible to future officials. Conversely, swidden space and village management does not fit since it does not take the shape of straight lines but instead follows streams and mountain ridges, contains rough edges, and often defines location in relation to another's field or a landscape marker (Roth 2004b).

Concerns around landslides, floods, soil erosion and sedimentation have driven much research and policy on agriculture on sloping lands (Blaikie and Muldavin 2004a, Forsyth and Walker 2008). A recurrent rationale for policies and projects has been that maintaining or increasing forest cover will secure key ecosystem services – often without much specific attention to tree species involved or impacts of alternative land-uses. The scientific evidence base for many services, like flood protection, however, often remains modest and controversial (Bruijnzeel 2004, Locatelli and Vignola 2009, van Dijk et al. 2009). Scientific knowledge about watershed services is frequently used selectively or misrepresented in justifying upland policies (Forsyth 1996, 1998, Walker 2003, Blaikie and Muldavin 2004b).

In Thailand, watershed classification (Chankaew 1996), like the definitions of forest lands, was also used as instruments to strengthen state control of upland resources, restrict expansion of farmlands in upland catchments and threaten highland farmers with resettlement (Vandergeest and Peluso 1995, Laungaramsri 2000). This is illustrated in the ground where watershed classification can even lead to entire provinces or districts in northern provinces of Thailand coming under strict conservation status. For instance, most of Mae Hong Son province falls under the highest order of protection Watershed 1A, thus prohibiting all settlement and agriculture, and placing huge stress on the communities who live and farm in the province. In practice implementation of the classification has been left incomplete as the Thai state does not have the capacity, political support or available land to resettle all upland farmers into lowland areas (Walker and Farrelly 2008).

Watershed classifications across the region are grossly similar with classes of high to lower restrictions on uses. Most areas in mainland Southeast with restricted classifications are in uplands (Thomas et al. 2008). The Watershed Classification Project carried out by the Mekong River Commission Secretariat between 1989 and 2001 elaborated a basin-wide classification indicating the sensitivity of watersheds with regard to resource degradation (mainly by soil erosion). It aimed to develop a decision-support tool. Along with the classification, the project produced general recommendations for sustainable land use in each Watershed Class. For instance, for “Watershed Class 1: Protection Forest Areas” with very steep slopes and rugged landforms, commonly uplands and headwater areas, the project said that as a rule, these areas should be under permanent forest cover. Notably, the project also added a caveat that “a*ccount needs to be taken of traditional rights and land use practices*” (Heinimann et al. 2005).

State schemes for classifying and planning land-uses do not correspond closely with actual provision of ecosystem services; swidden, multi-species orchards, and agro-forestry may yield more services than mono-crop plantations labelled as forests and assumed to be service-rich (Cairns 2007, Bhagwat et al. 2008, Xu et al. 2009). In Southwestern China indigenous land-use practices may be more beneficial to long-term conservation objectives than protected areas (Sharma and Xu 2007, Xu and Melick 2007). In the typical, dynamic and mosaic landscapes of much of upland Southeast Asia various ecosystem services are not coincident in space or time. Hydrological services like base stream flows at the end of the dry season and flood protection services during the wet season may both be valued even when how to secure them is not fully understood (Forsyth and Walker 2008, Neef and Thomas 2009).

Participatory land-use planning

A recurrent challenge for planning is getting adequate information about ecosystem services at scales relevant to decision-making (Turner and Daily

2008). Local knowledge is often crucial but only available if planning agencies allow space for meaningful local participation (Thomas 2006).

A good example is the work of ICRAF, CARE and local government and non-government organizations in the Mae Chaem watershed of Chiang Mai province (Thomas 2005). Such activities are also a helpful background to more bottom-up processes of basin management in areas beyond the rural-interface and merging into rural- peri-urban landscapes. When multiple stakeholders including scientific and local experts are involved, underappreciated services can be better understood, as for example, from Ruteng Park described earlier.

Institutional frameworks such as watershed management committees, organizations or networks, that may be mandated by government or emerge independently, can help solve local resource allocation problems. However, such organizations may not have much formal decision-making authority or budget but take on basic planning, conflict resolution and negotiation functions (Thomas 2006). In the Upper Ping river basin, the Thai government established several river sub-basin committees that each adopted slightly different committee structures and activity plans to deal with the range of stakeholders and issues important in their sub-basin (Thomas 2006). The challenge was introducing new organizations with recognized cross-sectoral planning mandates in a context where individual agencies and water user groups already had well-organized networks and coalitions (Thomas 2006, Mollinga et al. 2007). Local communities also make plans to manage their watersheds (Wanishpradist 2005). Overall, however, it is rare to find direct involvement of stakeholders in analysis of ecosystem services as a basis for informed negotiations and decision-making (Fisher et al. 2008).

A range of accounting techniques are available to help people understand dependencies on ecosystem services from generalized ecological footprints through to valuation of specific services (Jenerrete et al. 2006, Patterson and Coelho 2009). The ecological basis of many exercises, however, remains tenuous as context specific evidence is frequently lacking or inadequate. The importance of participatory and deliberative methods for accounting and evaluation is likely to grow (Spash 2007) especially where knowledge about hydrological services is strongly contested (Forsyth and Walker 2008).

Classifications reflect the interests of those who build them. There is a need to re-conceptualize land-use planning for conserving ecosystem services as a process of joint assessment and negotiation. Current land classifications produce tensions and conflict; they need to be adjusted to fit “prior use” of areas currently classified as “forest land” irrespective of the quality of forest now and reward good management rather than penalize it. Validation is possible with aerial photograph and satellite-based remote sensing.

Rules

Rules and regulations underpin plans helping to define rights of access and use of ecosystem services and responsibilities for their management. Institutional instruments are diverse including quotas, licenses, concessions, seasonal bans as well as other customary rules, taboos and norms.

Property rights and land tenure

Whether an ecosystem service is a private, public, club or common good makes a difference to how they might be governed (Engel et al. 2008, Patterson and Coelho 2009). Individual property rights for services which are excludable and rival are particularly useful to farmers as they encourage investment in land – for example to grow trees which may not provide returns for many years. Formal title deeds are also useful as collateral in obtaining loans (Walker 2006).

As public goods are used more intensively they can become rival goods and need other institutions to be managed sustainably (Fisher et al. 2008). Pre-existing private property rights may hinder efforts to manage for services that are common pool resources – rival, but non-excludable – and coordination mechanisms are needed (Patterson and Coelho 2009).

Some hydrological services like drinking water supplies from springs or streams are managed as club goods (Engel et al. 2008). Others are treated as common property of a sub-watershed, village or even a group of neighbors. Rules of use in community forests typically specify amounts or seasons during which valued but scarce forest resources can be collected (Cairns 2007, Kerr 2007). Rules for common pool resources are often flexibly bundled, so that allocation of scarce bamboo clumps or trees with resin or others needed for spiritual ceremonies might be allocated to individuals or households whereas access to regrowth might be open to all for grazing (Lebel 2005). Hydrological services like flood protection or dry season base-flows requires coordination between upstream and downstream users and findings ways to secure mutual benefit (Kerr 2007).

The conventional logic that formal land tenure enhances sustainable land and forest management is challenged by experiences in Thailand (Daniel and Lebel 2006). For example, although ethnic minority groups in the Northern uplands commonly do not have permanent land use rights, long-term investment in land resources is common practice (Neef et al. 2000). For ethnic people, formal access to land may often be less important than access to the Thai citizenship cards and the capacity and flexibility of household members in exploiting new income sources on-farm and off-farm (Knupfer 2002, Thomas et al. 2008).

A common strategy of farmers in trying to prevent land claims of state forestry officials where local rights are not otherwise recognized is to plant fruit trees or tea shrubs, as it was believed that forestry officials would not claim land that has already been planted with perennial crops. Another response was to convert rain-fed swidden rice fields or fallows to permanent paddy fields or cropping systems (Neef 2001). Additionally, some communities try to avoid land losses through "appeasing" of the forest officers by being active in "forest protection" and reforestation (Knupfer 2002).

Lao PDR, Vietnam and China went through periods of collectivization and then re-allocation of agricultural and forest land so some of the tenure issues are different than those in Thailand (Thomas et al. 2008). Land has been allocated to both individuals and villages. The Lao government has had a particularly forceful policy of ending swidden cultivation.

Overall, it is hard to draw strong conclusions on the relative performance of formal and informal arrangements. In remote areas a lot depends on local institutions and relations with local officials rather than formal land certificates and regulations (Walker and Farrelly 2008, George et al. 2009). Both formal and informal tenure can matter, and that their interplay can be positive with respect to livelihoods and environmental outcomes. With proximity or when more profitable opportunities arise – for instance related to eco-tourism or logging concessions – ambiguities in land tenure often become more problematic (Wunder et al. 2008a). Clarifying property rights can be an important aspect of governance of upland watershed services, but formal land tenure is not necessarily a pre-requisite to establishing management systems for ecosystem services, especially where informal, use rights are locally recognized and respected.

Community-based management

Property rights may be vested in communities rather than households and individuals. Community forests have become an arena for spatial negotiation of land and forestland use between the state, timber companies and local communities as well as a means of promoting local participation in forest management. But many community forest programs are failing because of external factors promoting forest degradation are stronger.

In Cambodia, ministerial order recognizing forest sites as potential community forestry areas is the first step towards formal recognition of community management of forest areas. In December 2008, more than 100 villages in several provinces were granted formal management of about 127,000 hectares of forest in 87 forest sites by Cambodia's Minister for Agriculture, Forestry, and Fisheries. Another 37 potential community forest areas covering 18,000 hectares were already recognized in Siam Reap in 2007 bringing a total of 145,000 hectares of forest under recognized local management. The next step of formal registration through signing a CF Agreement with the Forestry Administration, will give communities full legal access and management rights over local forest areas for 15 years, protecting these areas from commercial and other outside interests. It also enables some of Cambodia's poorest people to benefit economically, with rights to use forest resources including timber (RECOFTC 2009).

In their comprehensive review of community-based forest management in the Philippines, Lasco and Pulhin (2006) conclude that the strategies of planting trees in farms and landscapes has had largely positive environmental effects, for example, for soil and water conservation, carbon sequestration (also see section below) and biomass production. Other studies of complex agroecosystems like benzoin and rattan gardens in Indonesia highlight how reduced intervention in the system can lead to ecological succession-processes increasingly similar to those found in native forests after disturbance and thus important to biodiversity conservation as well as productive use (Garcia-Fernandez and Casado 2005). Agroforestry practices using trees and cover crops greatly reduce soil erosion compared to monoculture plantations without groundcover (Sidle et al. 2006).

Management practices cannot be understood separate from their social example. For example, the tea or *miang* forest areas in Nan province of northern Thailand, important for supplying tea, are not only maintained as a watershed forest comprising part of the *muang faai* traditional irrigation system, but also serve as an agro-ecotourism centre bringing in cash income and supported by the local government (Wittayapak and Dearden 1999).

Co-management for resource use can produce differing tensions depending on the policy emphasis on village, households or individuals. In Vietnam, for instance, during the 1950's and the 1960's, the national government encouraged villages to formulate cooperatives, though the membership of the cooperatives and decision-making processes may have continued to reflect traditional modes of operation. By the 1960's and 1970's, the government tried to establish multivillage cooperative units or communes. However, the 1980's brought policies that shifted away from collectivization, returning authority to the village, and, most recently, to households. This may make it possible for villages may regain greater autonomy, creating opportunities for traditional institutions to reestablish their role in resource-use decision making. Yet government policies and programs, while de-emphasizing collectives, give little recognition to the role of the traditional villages. Instead, these new policies and programs emphasize empowering the household or individual (Sowerine et al. 1998, Sowerine 2004).

Co-management arrangements with state agencies, firms and other actors are institutionally diverse. One of the recurrent factors important to success is building networks of trust which enable social (Lele 2004, Armitage et al. 2009, Berkes 2009). In the context of upland watersheds with their dynamic and complex mix of ecosystem services valued at multiple scales (Lebel et al. 2008) the challenges and rewards are particularly high.

Logging concessions

European forestry influences are evident in state forest management practices that follow scientific forestry norms developed in the eighteenth century and which were focussed on supplying colonial powers the raw materials to industrialize (Bryant et al. 1993, Lang 2000, Contreras 2003). In mainland Southeast Asia, the colonial British Empire dominated and controlled the teak trade in India, Burma (Myanmar) and Thailand. In Vietnam, Laos and Cambodia it was the French. Colonial forest centralized authority in national capitals, using licenses, concessions, and military force as needed to gain control of forest resources.

Southeast Asian governments and their corporate counterparts have viewed logging as an important source of power and revenue (Pasong and Lebel 2000, Dauvergne 2001, Butler and Laurance 2008). Revenues from timber exports in the Philippines in 1950-1969 were used for rebuilding the country from the devastation of wars. In Malaysia, timber rents make a significant contribution to growth, exports, savings, investment, government revenue and fiscal capacity. Forestry is a dominant sector in the Laotian economy: despite restrictions on logging and high export taxes implemented in 1989 – which decreased its share of total exports by 36 percent – timber and wood products remained the major export (replacing hydroelectricity). In 2000, the forestry sector contributed 5 percent to GDP increasing from 3.4 percent in 1990 (FAO 2002). In Cambodia, both the Khmer Rouge and afterwards the elected government exported timber to Japan, Thailand and Vietnam (Billon 2000).

The Indonesian government took control of forest resources in 1967 distributing over 60 million hectares (ha) in timber concessions to private companies often connected to military leaders (Pasong and Lebel 2000, Dauvergne 2001). The industry is controlled by only a handful of players; Barito Pacific, for example held more than 10 percent of the concessions and control over about 6 million ha.

The management of forests in Indonesia was based on a land use classification which distinguishes protected forests, limited and general production forests, and conversion forests and areas for parks and reserves (Dick 1991). Clear felling is allowed in conversion forests, and transmigration settlements are developed from contiguous logged areas. In production forests, concession period by timber and logging companies had been extended to 35-year harvesting cycle to induce them replant and pay the government appropriate fees from forest exploitation.

The need to generate foreign exchange for debt servicing, the increased demand for raw industrial materials both in the domestic and international markets have helped induce the replacement of complex forest ecosystems by monoculture plantations. The pulp and paper industry for instance in Indonesia has expanded rapidly since the 1990s. Some estimates suggest that as little as 10 percent was actually harvested from plantation timber with rest coming from illegal cuts in natural forests. Forests were also cleared to plant fast-growing species (Barr 2001). This conversion to tree plantations has resulted in forest loss and internal displacement, increased social conflicts over land, and worsened small-landholder tenure insecurity (Lang 2002).

In Lao PDR, the rising price of natural rubber products due to the demand of the Chinese market over the last decade has attracted rubber plantation investors from China, Thailand and Vietnam to seek land concessions all over the country (Manivong and Cramb 2007). Throughout the region one of the largest concerns is the impacts on water-use as rubber is a demanding crop and many of the areas where is now expanding are highly seasonal with dry season where water scarcities are already a constraint on agriculture (Xu 2006, Mann 2009, Ziegler et al. 2009).

Logging bans

Several countries have invoked logging bans in native forests in response to serious flood events (Daniel 2005, Xu et al. 2007).

Until the 1989 logging ban, the Thai government gave concessions to companies to log large parts of the forest area that lay outside national parks and wildlife sanctuaries. Indiscriminate logging practices usually led to continuing deforestation where 30-40 percent of the residual younger trees were destroyed. Hence, most logged-over forest areas became quickly degraded, and were further exploited by human activities as rural communities and land speculators obtained access through the logging roads (Kashio 1995a, 1995b).

After the 1989 logging ban, the Thai government promoted a wood import policy and Thai logging companies expanded logging concessions into the neighbouring countries of Laos, Cambodia, and Myanmar (Daniel 2005). The logging of neighbouring country forests has also resulted in illegal logging operations in Thailand's forests, particularly along the borders (Cooper and Palmer 1992). Illegal logging in the forests of the Salween National Park and the Salween Wildlife Sanctuary along the Burma/Myanmar and Thai border was one of the most well-known timber scandals in the post-logging ban period.

China's logging ban was introduced in 1988 alongside several other major policies, like the sloping land conversion program of 1999, that combined enforcement and incentives to increase forest cover on sloping lands (Bennett 2008). These national policies have had major impacts on livelihoods and land-uses in the ethnically diverse sub-tropical watersheds of Yunnan Province (Xu and Melick 2007, Xu et al. 2007, Xu et al. 2009) leading to, for example, the almost complete elimination of swidden cultivation by the Hani and its replacement by rubber (Xu et al. 2009).

Incentives

Payments for ecosystem services

Payments for environmental, or ecosystem, services (PES) have emerged as an alternative or complement to spatial planning and regulatory approaches to conservation (Wunder 2007, Engel et al. 2008). PES schemes are voluntary transactions in which an environmental service is bought by a buyer from a provider if and only if the provider secures service provision (Wunder et al. 2008b). Such schemes share similarities to eco-certification of products and other incentive-based mechanisms, like environmental taxes or subsidies (Engel et al. 2008, Jack et al. 2008). Common challenges include clarifying property rights, getting prices right and linking actions to compensation (Fisher et al. 2008). PES appear to be most relevant when an ecosystem service is under threat in marginal lands where opportunity costs are modest and land claims clear (Wunder 2007).

For PES, the distinction of whether the ES provided are public goods or those in which they are not is an important distinction. Not all ES are pure public goods, i.e. consumption by one user does not affect consumption by another; many other ES are, in fact, either excludable or rival in consumption. In particular, many water services are "club goods" where only those holding water rights or those located in a well-delineated watershed benefit. This has implications both to identify the users and arrange for them to pay for service provision as well as to direct the benefits to the providers. This can affect questions of equity as well (Corbera et al. 2007).

To date only a few such schemes have been operating for a significant period in Southeast Asia; quite a few of these deal with watershed protection and related services. Many are related to the Reward the Upland Poor for Environmental Services (RUPES) program (Swallow et al. 2007, Van Noordwijk et al. 2007, Leimona et al. 2009).

In the Philippines, concern over loss of biodiversity ranked very high among stakeholders in designing a PES program in the Peñablanca Protected Landscape. The PES program thus was initiated with high conservation, cash payments and investments in carbon crediting as the most beneficial option. The design of the PES program showed that the linkages between land use and the level of environmental services was crucial to the sustainability of the PES program. The financial, economic, social and environmental factors were of equal importance in designing the PES program (Bennagen et al. 2006).

In northern Thailand, upstream, ethnic minority, communities are expected to conserve upland watersheds, stream flows and biodiversity while also simultaneously being widely perceived by lowland communities and policy-makers as a threat to, rather than providers of, ecosystem services (George et al. 2009, Sangkapitux et al. 2009). A study in the Mae Sa watershed found that payments for water resource by downstream resources users was possible with upstream farmers willing to adapt their farming practices given adequate compensation (Sangkapitux et al. 2009). While building awareness about ethnic communities' sustainable practices around ecosystem service projects could help change lowland perceptions, discrimination against upland minorities continues due to power and control over upland resources residing with lowland Thai policy makers.

Wunder et al. (2008b) reviewed a sample of programs invoking payments for environmental services that included several studies from tropical South America and found user- as opposed to government-financed programs were better in terms of fit to targeted beneficiaries, local conditions and needs, and monitoring. China, Mexico and Costa Rica each have large programs giving payments to landowners for changing land-uses (Sanchez-Azofeifa et al. 2007, Jack et al. 2008).

Rewards or compensation does not have to be direct cash payments to individuals; they could be non-monetary payments to groups or in form of guarantees of privileged or secure access (such as land tenure) to services or other resources like training (Leimona et al. 2009, Neef and Thomas 2009). Non-financial incentives may be more important to poverty alleviation than direct payments (Leimona et al. 2009).

In the complex resource management situations typically found in upland watersheds introducing new markets for ecosystem services needs to consider carefully existing access rights as well is who is excluded and who will benefit or be at a disadvantage (Corbera et al. 2007, Mollinga et al. 2007). Poor, marginalized and otherwise vulnerable groups are often more dependent on ecosystem services and have relatively low opportunity costs than others (Jack et al. 2008) but their capacities to engage may also be limited. Poor farmers in Vietnam uplands with small holdings were unlikely to join reforestation schemes unless compensation was adequate to cover loss of food production (Jourdain et al. 2009). Moreover, when there are many poor small providers transaction costs can be high and thus not competitive (Jack et al. 2008). Studies of two carbon sequestration projects in Mexico showed how women and poorest were excluded from designs and that outcomes reflected political affiliations with project managers (Corbera et al. 2007). Non-participants in ecosystem services projects may also be impacted adversely, for instance, when landless farmers lose access to common pool resources (Wunder 2008). Although evidence about welfare impacts remains modest the emerging findings suggest that PES programs, on balance have had relatively small positive effects, and are unlikely to become central to poverty alleviation efforts (Wunder 2008).

Ultimately, how rules are arrived at may matter as much as their final form. Thus, who runs a project is a crucial feature of PES schemes (Corbera et al. 2007, Wunder et al. 2008b). Intermediaries may be created by service buyers or sometimes a third party. Non-governmental organization may be helpful where farmer's groups (as providers) are not formally recognized or buyers unfamiliar with negotiating directly with farmers (Neef and Thomas 2009). Reliability of the organization and the ability to build trust in schemes are crucial (Koellner et al. 2008, Neef and Thomas 2009). An assessment of the management capacity of seven organizations that sell ecosystem services from tropical forest in Latin America, for example, found that marketing and client satisfaction were often neglected and that different market actors have very different criteria and preferences making it necessary for suppliers to target offers carefully (Koellner et al. 2008). The role of marketing in successful PES activities has not received adequate attention.

Monitoring of policies and projects is important to: detect incomplete or distorted implementation; assess compliance with agreements; evaluate actual impact; and, learn from past to improve future interventions (Lebel and Daniel 2009). Payments must be based on what can be monitored, usually land-use, but in case of carbon sequestration projects more precise accounting is often possible (Wunder et al. 2008b). Sometimes the evidence-base that links land-use to delivery of particular environmental services is weak (Wunder 2007). The typical assumption that "forests" provide the necessary ES is a good example. Another problem is permanence: how to ensure ecosystem services continue to be protected, especially after payments from a particular program or policy end (Wunder et al. 2008b). Donors may be worried about financing long-term projects and how to handle non-compliance given traditional role as aid providers (Wunder et al. 2008a).

Despite some significant limitations, PES and related schemes are an important addition to the set of policy options and instruments to integrate conservation and development. The quality of such schemes ultimately rests on achieving a shared understanding of ecosystems services, benefits and burdens.

Certification

Certification is a practice intended to give a "green" seal of approval to tree plantation or "reforestation" projects and includes chain-of-custody monitoring. One of the foremost timber certifiers is the Forest Stewardship Council, whose members comprise forestry and forestry-related corporations that are part of its "economic chamber". In the 1990s, successful NGO campaigns, particularly regarding unsustainable logging practices in the tropics, led to increased consumer awareness about the consumer's role in forest destruction. When consumers began to ask their suppliers for certified wood, a number of NGOs, together with businesses, decided to promote a process for enabling companies to offer and consumers to choose a "green" product, and resulted in the establishment of the FSC. The FSC allows certifier companies to inspect and then certifies logging and plantation companies who can then sell timber with a FSC certified label.

FSC's certifier companies are active in Southeast Asia and the Mekong region: In 2006, two forest areas in central Laos covering about 50,000 ha in the provinces of Khammouane and Savannakhet, were the first forests in Indochina to achieve FSC certification (WWF 2006). But the independence and credibility of the FSC has increasingly come under question with FSC's failure to prevent the certification of non-compliant companies (Carrere 2006, Butler and Laurance 2008).

Instead of limiting FSC to forest management certification, organizations and businesses participating in the process decided to also include plantation management as part of its mission lending FSC support to contentious large scale monocultures that have resulted in severe impacts on many indigenous and other local communities. In the Mekong region, FSC chain of custody has been no guarantee against illegal timber smuggling for instance from Laos to Vietnam.

Information

Increasing public awareness of ecosystem services can help garner wider support for their conservation at level of policies and for improving management practices in watershed areas(Patterson and Coelho 2009). This can be simply at the level of identifying and communicating previously unknown or under-appreciated services, through efforts to value benefits, to integrated assessment of social and ecological impacts and responses (Braumann et al. 2007, Lele 2009).

Opening plans and information to scientific review and consultation is vital to ensure that any relevant policy options are not missed or ignored. This is especially true for instance with fire management where the conventional view of fire is that of a destructive agent requiring immediate suppression. Fire management is crucial for some forest ecosystems to thrive and ensure continued carbon stocks and fluxes (Murdiyarso and Lebel 2007). Fire and disease management can be used to meet land management goals under certain ecological conditions.

Forest management practices for carbon conservation and sequestration range from slowing down deforestation and assisting regeneration in the tropics to afforestation schemes and agro-forestry (Canadell and Raupach 2008). Carbon sequestration can help with climate change protection, but there are many constraints to effective climate-forestry policies. Accidental and deliberate spread of fires into forests can result in huge emissions of CO2 destroying carbon stocks and affecting other watershed services (Murdiyarso and Lebel 2007). The best option for reducing carbon emissions in tropical regions is to avoid deforestation and degradation in the first place (Canadell and Raupach 2008).

At the 15th Conference of the Parties in Copenhagen under the United Nations Framework Convention on Climate Change (UNFCCC) it was agreed to pursue a mechanism for reduced emissions from deforestation and degradation or REDD (UNFCCC 2009). REDD has potential to benefit developing countries, including swidden cultivators (Mertz 2009), but only if the funding channels and projects are designed in ways that the poor actually benefit – an outcome highly contingent on quality of governance within countries.

A formal meta-analysis of studies exploring the watershed services provided by tropical forests and plantations (Locatelli and Vignola 2009) found evidence – contrary to public perceptions and official policies of several countries – for lower base flows under planted forests than non-forest land-uses. It should be emphasized that this evidence comes from studies of only pine and *Eucalyptus* plantations; how plantations with other or native species effects the hydrological cycle is not known. This is consistent with earlier reviews (Calder 2002, Bruijnzeel 2004). At same time some evidence was also found for lower total flow and higher base flow under natural forests than non-forest land uses when a subset of data from small watershed studies with large differences in forest cover were analysed (Locatelli and Vignola 2009). The authors acknowledge important constraints in number of available studies of different forest types, and noted that when larger dataset including larger watersheds was analysed no significant differences were found.

Valuation studies have to make many assumptions, but may help convince decision-makers on the needs for conservation of certain land-covers and –uses because of the ecosystem services they provide. Most studies are hopeful about policy impact rather than demonstrating it.

As an example of a typical study Chanhda and colleagues (2009) divided land-use in Luang Namtha province of northern Laos into six classes and derived ecosystem service values for each category based on 11 biomes in a global ecosystem service valuation model (Costanza et al. 1998). On this basis the authors estimated that the forest land cover changes in Luang Namtha Province resulted in a net decline of US$ 8.9 million in ecosystem services between 1992 and 2002 from potential forests. The decline in the value was due to soil erosion, flooding, drought and other impacts. The authors concluded that the high rate of loss of such services will have serious long-term negative ecological consequences and recommended that land-reclamation projects be controlled and based on rigorous environmental impact analysis that included assessment of impact on the ecosystem services (Chanhda et al. 2009). Use of such indirect estimates for services has many limitations given that values for even an individual service from a particular forest type can vary widely among places (Lele 2009).

A much more detailed and convincing analysis is that done by Pattanayak & Kramer (2001) investigating drought mitigation services of forests in Ruteng Park, Flores, Indonesia. They found evidence that the park provided a drought mitigation service in the form of base-flow to farmers downstream and were able to estimate its value in terms of coffee and rice products. Using scenarios for re-establishment of forests consistent with goals of park management they were also able to show that further increases in forest cover would result in both increases and decreases in base-flow depending on local conditions and land-uses in different watersheds. From a policy perspective this implies could target specific watersheds with right mixture of climatic and other features where increased protection will yield benefits of this service (Pattanayak and Kramer 2001).

The complexity of landscape changes in many upland watersheds and diversity of services and interests they provide within and beyond the watershed precludes holding much faith in the absolute numerical findings of valuation studies. At least as important as understanding aggregate economic welfare is addressing the question of wins and who loses under different scenarios of landscape change and why (Lele 2009). Van Beukering and colleagues (2003) note after their valuation of multiple services from Leuser National Park on Sumatra, Indonesia, that although conservation benefits many stakeholders the "*political power of logging and plantation industries*" means that benefits continue to accrue to just the few stakeholders that favour logging and deforestation. Public awareness building, consultations and negotiations may be critical to secure support for management strategies (Pretty and Smith 2004).

Discussion

Upland watersheds in Southeast Asia provide a diverse range of ecosystem services that are often highly specific to particular land-covers and ecosystems present, the landscape configuration, and social organization. A diverse range of projects, policies and other initiatives have aimed to alter how these services are governed. In this paper we explored these through the lens of plans, rules, incentives and information.

Planning has conventionally been led by government bureaucrats relying on neat physical and institutional separation into conservation and use and instrumentally-driven definitions of classes. Forest and watershed classifications and zoning schemes have been constructed assuming and asserting strong relationships between particular classes and ecosystem services without attention to service users, alternative land-uses or how ecosystem services are actually provided. This has led to unnecessary conflict between state agencies and local communities, disincentives for local conservation actions, and missed opportunities for activities that would maintain ecosystem services and also contribute to poverty alleviation.

Meaningful participation of local resource users alongside the conventional planning done by managers and, more recently, ecosystem experts, should lead to more informed and appropriate land-use plans for upland watersheds that have a chance of being implemented. Deliberative approaches to planning and assessment should help deal with competing knowledge claims about relationships of different land covers and uses with ecosystem services while recognizing that uncertainties of understanding may not be easily reducible. Local engagement is particularly crucial as the benefits of improved watershed management are often localized and without cooperation and partnerships long-term management goals are hard to pursue (Aylward 2005, Warner 2006).

Regulations important for managing ecosystem services can be top-down, self-generated or more frequently a combination of local, informal, rules and national, formal, regulations (Lebel and Daniel 2009). Interventions where there are multiple ecosystems services and derived benefits invariably create winners and losers. Projects and policies to improve watershed management are undertaken in the context of pre-existing institutions (Mollinga et al. 2007) and as a consequence power relations which modify implementation and help shape outcomes. There is therefore a need to strengthen legal support and information sources for disadvantaged groups – like ethnic minorities – in dealing with formal legal processes. We suggest that it is important for future land and forest policies to leave some flexibility for local government and communities to adjust property right systems to local cultural and ecological contexts of upland watersheds. This can take place within a wider framework, for example, that strongly restricts commercial exploitation of certain forest products, but not their subsistence uses.

Incentives can encourage provision of desired ecosystem services and protection of the ecosystems that underlie provision of those functions. Experiences with payments or rewards for ecosystem services is growing in the region suggesting that when used appropriately it will be helpful addition to the set of policy options and instruments to integrate conservation and development in particular places. Outstanding issues include ensuring equitable access, legitimacy of process, and that changes in watershed management actually contribute to well-being of those in most need (Chan et al. 2007, Corbera et al. 2007, Wunder 2008). These challenges are not restricted to instruments like payment or rewards for ecosystem services. A review of 103 ecosystem service projects – from 37 countries – implemented by The Nature Conservancy and the World Wildlife Fund (WWF) looked at projects using traditional conservation tactics such as land purchase and restoration, but also adopting new approaches such as targeting working landscapes, using new financial tools, and involving corporate funding and partners (Tallis et al. 2009). The review showed that all kinds of projects sometimes but often did not meet priority socio-economic needs.

Voluntary approaches are often more flexible than regulations and plans but only work if incentives are adequate or messages and social norms are persuasive enough. Building awareness about ecosystem services is invariably an important part of any intervention, locally or externally led. At the same time many projects and policies have been pursued in absence of detailed understanding of ecosystem functions and services (Carpenter et al. 2009, Daily et al. 2009). Un-validated assumptions about the relationship between land-covers and hydrological services from watersheds, in particular, abound (Bruijnzeel 2004, Aylward 2005). Much more research on ecosystem services is needed across Southeast Asia, from understanding of ecosystem processes through to benefits and impacts on people. For many watersheds where decisions are being made now significant knowledge uncertainties will remain. Critically drawing on diverse knowledge sources with an expectation that will need to negotiate, learn and adapt is the best strategy.

Projects and policies that hope to successfully improve the management of ecosystem services should seek, and expect, to learn from past interventions. Actual management practices in use for timber, water and other ecosystem services from upland watersheds frequently do not match plans on paper, follow agency rules or fit government or other expectations based on simple incentives.

Positive changes to ecological sustainability and human well-being are rarely demonstrated directly. In our review, we found monitoring to be the least well developed area of governance: independent and timely post-evaluations of projects and policies are necessary but rare.

There are many reasons including uncertainties in how ecosystems and people will respond to interventions (Berkes 2009), as well as more insidious ones, like deception and corruption. Institutions need to be flexible enough to update rules to fit new knowledge or emerging conditions rather than assuming solution is identifying the best practice, land-use or allocation (Lebel et al. 2004). The spread of invasive species, climate change and other larger scale environmental changes with potential impacts on ecosystem services (Chopra et al. 2005) provided by upland watersheds implies that adaptive responses will be imperative.

Conclusions

The upland watersheds of Southeast Asia provide a range of ecosystem services and derived benefits important to well-being of people within them and beyond. The specific services provided and how they are valued vary hugely from place to place underlying the importance of both ecological and social context. Communities, governments and firms have taken different approaches to negotiating and sharing these benefits, as well as trying to deal with trade-offs between them. In this paper the governance of services was explored through the lenses of plans, rules, incentives and information.

Four broad conclusions emerge. First, multi-stakeholder planning improves the assessment of under-appreciated services and users, but does not eliminate importance of power relations or contestation of knowledge claims by stakeholders with divergent interests. Second efforts to regulate the management of specific or an ambiguous set of ecosystem services with externally imposed rules invariably create winners and losers with outcomes which often depend on pre-existing institutions, political contexts and dominant beliefs about relationships between land-covers and ecosystem services. Third incentives to conserve ecosystem services are closely related to perceived benefits of doing so regardless of whether direct monetary payments are involved or rewards are in other forms. Fourth, shared understanding of the evidence for, and uncertainties around, particular ecosystem process, service and benefit relationships, is crucial to progress, underlying the importance of monitoring and more adaptive approaches to integrating ecological and social understanding.

Taken together these findings underline the need to pay greater attention to issues of governance in the design and implementation of policies and projects to manage ecosystem services from upland watersheds. Improving governance of services is both a technical challenge of improving understanding of ecosystem processes and how they relate to benefits, and a social challenge of ensuring that interventions allocate benefits and burdens fairly while also improving the well-being of vulnerable and otherwise marginalized peoples.

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Multi-Stakeholder Platforms (MSPs)
John Dore

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3.1 MSPs: A basis for fairer water governance

Multi-Stakeholder Platforms (MSPs) are a part of governance in which different stakeholders are identified, and usually through representatives, invited and assisted to interact in a deliberative forum that focuses on:

- sharing knowledge and perspectives;
- generating and examining options;
- informing and shaping negotiations and decisions.

MSPs are not the only places where deliberation takes place. MSPs and dialogues are words that are often used interchangeably. This may be misleading. Any 'dialogue process' implies deliberation is central. There may be much dialogue and deliberation embedded in advocacy organizations, diplomacy, operations within the party room, the parliament, contract drafting, the corporate board room or the village committee. However, as the name specifies, MSPs refer to where deliberation is fostered among multiple, diverse stakeholders.

MSPs are an approach for constructive engagement and learning about complex problems where facts and values may be in dispute. Choices about water often involve society contesting facts, such as the most efficient way to supply water, recover delivery costs, and provide efficiency incentives. Choices about water also often involve contesting values, for example, whose priorities and needs matter most, when there is insufficient water to satisfy all demands.

MSPs may lead to the creation or strengthening of bridges of understanding between actors representing wide-ranging interests, and the satisfactory resolution of at least some differences. An MSP can bring into sharper focus substantive differences of approach and priorities that may not be easily reconcilable. By articulating these differences in the public sphere, an MSP can contribute to a sounder basis for negotiation and decision making.

"MSPs ARE AN APPROACH FOR CONSTRUCTIVE ENGAGEMENT AND LEARNING ABOUT COMPLEX PROBLEMS"

MSPs can be influential by bringing together stakeholders in a new form of communication and decision finding.1 In this way, they can ensure that differences are respected – or at least better understood – while pursuing fair and effective workable agreements about complex issues.

Influence is different to authority.2 Many MSPs are not necessarily vested with, nor must they claim, authority to make decisions. To do so may invite resistance and be counter-productive. Although not all dominant political cultures support or permit MSPs, in many places MSPs are part of a broader trend towards new forms of governance based on collaboration that build and draw upon social capital.

"MSPs CAN BE INFLUENTIAL BY BRINGING TOGETHER STAKEHOLDERS IN A NEW FORM OF COMMUNICATION AND DECISION FINDING"

A way of focusing the MSP contribution to water negotiations is to use the 4Rs, (introduced in Chapter 1) as part of a systematic and semi-structured approach. Recapping, the 4Rs refers to rewards, risks, rights and responsibilities. For example:

- The rewards being sought from the care, use and further development of water resources, and the distribution of the full spectrum of the possible rewards/benefits/costs of various options;
- The involuntary and voluntary water-related risks;

- Water-related rights;
- The various water-related responsibilities of state and non-state actors.

While 4Rs can always be useful as reference points, MSPs do not all need to follow the same format or structure. MSPs exist in different shapes and sizes. But, as a guide, there are desirable characteristics of MSPs. These are summarized in Figure 3.1 and explained in Sections 3.2–3.5 to provide an outline for an ‘ideal-type’ of MSP that can contribute to fairer, more effective water governance.[3]

“**MSPs EXIST IN DIFFERENT SHAPES AND SIZES”**

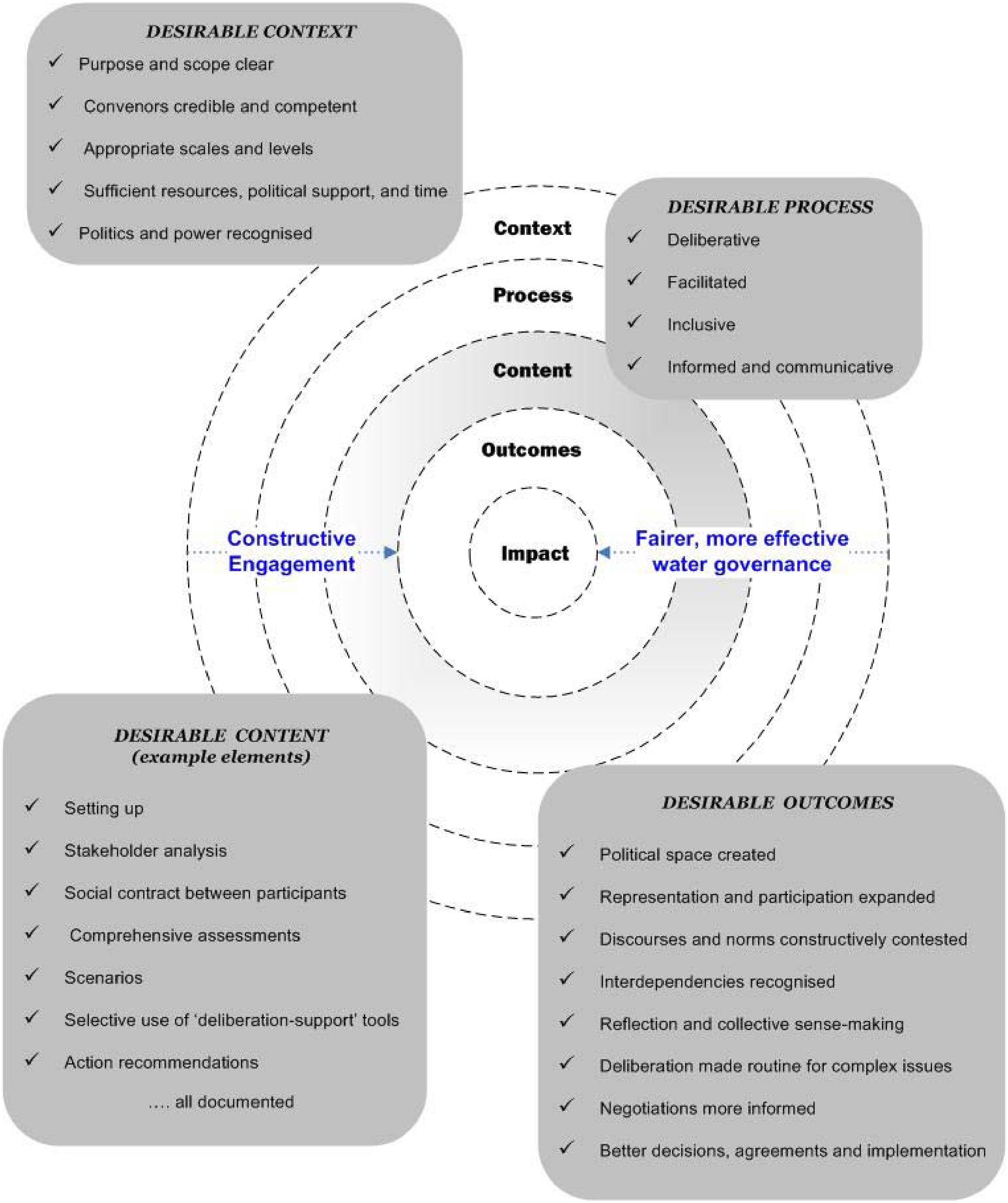


Figure 3.1 MSP conceptual framework and desirable characteristics

3.2 Desirable context for MSPs

3.2.1 Clear purpose and scope

The purpose of an MSP needs to be clearly articulated in terms of its political and practical boundaries to enquiry, the derivation, extent and duration of its mandate, and a justification of how the MSP might improve existing governance.

Questions to consider include:

- Is the MSP trying to shape the higher-level discourse of the wider political and institutional environment, i.e., the 'big context'? Examples are MSPs focusing on climate change and its implications (including for the Earth's hydrological cycle), examining global drivers and possible societal responses, such as mitigation approaches, financing adaptation, and establishing equitable carbon markets. Other MSPs include the deliberations before, during and after global fora such as the World Water Forum and the World Water Congress.
- Is the MSP focusing on building a policy-shaping network and space for debate in a particular community or place, intending to catalyze reflection and action on some shared issues? An example is the MSP working with the many actors and institutions with a stake in improving river basin governance in Namibia and Botswana's Okavango floodplain; or the Mekong region (see Case 3.1).
- Is the MSP focusing on informing and shaping a particular negotiation process? For example, devising a fair and effective water allocation and management regime in the irrigation systems of the Vietnam delta; or the MSP informing the negotiation and review of the agreement to enable the continuation of mining –subject to more stringent Fly River pollution controls, and sharing of rewards – in the western provinces of Papua New Guinea.[4]

Answers to these questions should determine the design of the MSP and tactics to optimize engagement, particularly regarding choices of convenors, facilitators, invitees, agenda and tools.[5] There are more ideas on how to clarify the purpose and scope of an MSP later in this chapter.

"THE PURPOSE OF AN MSP NEEDS TO BE CLEARLY ARTICULATED"

Case 3.1 "Exploring Water Futures Together" in the Mekong Region

A new water governance paradigm was needed in the Mekong Region which encompasses Cambodia, Laos, Myanmar, Thailand, Vietnam and southern China.

On main streams and tributaries disputes exist resulting from interventions to natural flow regimes and overt or default allocation decisions. These interventions are justified on grounds of: flood control, more irrigation for food or fibre production, urban or industrial supply, improving ease of navigation, or boosting energy production via hydropower. There are associated disputes about altered sediment and nutrient loads, fisheries, livelihood options, groundwater use, water re-use, and diversions (inter-state, intra-state, inter-basin and intra-basin).

An alliance of actors in the Mekong Region cooperated to convene and implement an MSP undertaken at national and regional scales. The convening coalition comprised: IUCN, the Thailand Environment Institute (TEI) – a national organization focused on sustainability; the International Water Management Institute (IWMI) – an international research organization; and the M-POWER regional knowledge network whose core membership is from, and focus is on, the six Mekong Region countries.

The purpose and scope has been to make it routine in the Mekong Region for important national and transnational water-related options and decisions to be examined in the public sphere from a range of perspectives. The MSP aimed to demonstrate this practice.[6]

3.2.2 Credible and competent convenors

Convenors are those who call people to come together and collectively engage in an issue. There are many possible convenors for MSPs and they can be either from within or outside of government (see Box 3.1). Credibility and competence are essential. Credibility will be linked to the 'social capital' of the convenor or convening coalition. Without the capacity to build new or upon existing relationships, convenors will be unable to establish an MSP constituency. Without competence, convenors will not be able to maintain the constituency or have an effective engagement.

Box 3.1 MSPs and dialogue tracks 1, 2, 3

The terminology of dialogue tracks 1–3 is one way of differentiating between water governance fora, some of which are MSPs, and the different convening possibilities.

Track 1 refers to processes of governments and associated bureaucracy, including inter- and intra-state fora. In the eyes of States these are 'official' and most legitimate. The dominant logic is, for the most part, still implicitly accepting of rational, self-interested behaviour, particularly in international affairs. Track 1 dialogues are convened by state actors for state actors. The UN General Assembly is an example. They may be deliberative, but they are not multi-stakeholder.

Track 2 refers to governance processes involving State, UN family, donor/lender, civil society and business. These interactive forums are usually convened and led by an actor or coalition closely aligned with States ensuring government representatives remain privileged actors, such as with the International Assessment of Agricultural Science and Technology for Development (IAASTD). The convenors are usually focused on enhancing the effectiveness of States by widening the field of ideas and influences. Track 2 MSPs may be convened by state or non-state actors, but usually widen the range of stakeholder involvement.

Track 3 refers to research, dialogue and advocacy efforts led by civil society or business, less impeded by or less subordinate to State actors. These fora are committed to enlarging the political space and are often optimistic about the potential of MSPs to find and assist in negotiating better ways forward for society. The convening is led by non-state actors, and by design should bring in the full range of relevant stakeholders or possible contributors to addressing an issue. Convening coalitions are often a useful way of aggregating the social capital of the individual convenors. Tracks 2 and 3 are often now grappling with the idea and practices of deliberative MSPs. Practice may be less than ideal, but there are many promising efforts around the world where Tracks 2 and 3 are trying to improve the quality of their MSPs to inform and shape water-related debates, generate options, and inform and shape negotiations.

3.2.3 Appropriate scales and levels

Clarifying purpose and scope is a precursor to thinking about scales and levels.7 Scale is the spatial, temporal, quantitative or analytical dimensions used to measure, or rank, and study an issue (see Figure 3.2). Levels are the units of analysis that are located at different positions on a scale.

Water management is often institutionalized around the spatial scales of government (i.e., administrative) or hydrology. The scale of government has different levels, for example: district, provincial, national, regional, global. The scale of hydrology also has different levels, for example: water-well, aquifer, stream, lake, reservoir, small watershed, larger national river basin, or international river basin.

MSP convenors must be aware that analysis and action may best occur at various scales and levels – single or multiple. For complex water issues it is usually multiple. A strength of MSPs is that they can be flexibly constructed so as to fit any scale or level, but also to enable cross-level and cross-scale deliberations.

"**CLARIFYING PURPOSE AND SCOPE IS A PRECURSOR TO THINKING ABOUT SCALES AND LEVELS**"

Figure 3.2 Scales and levels

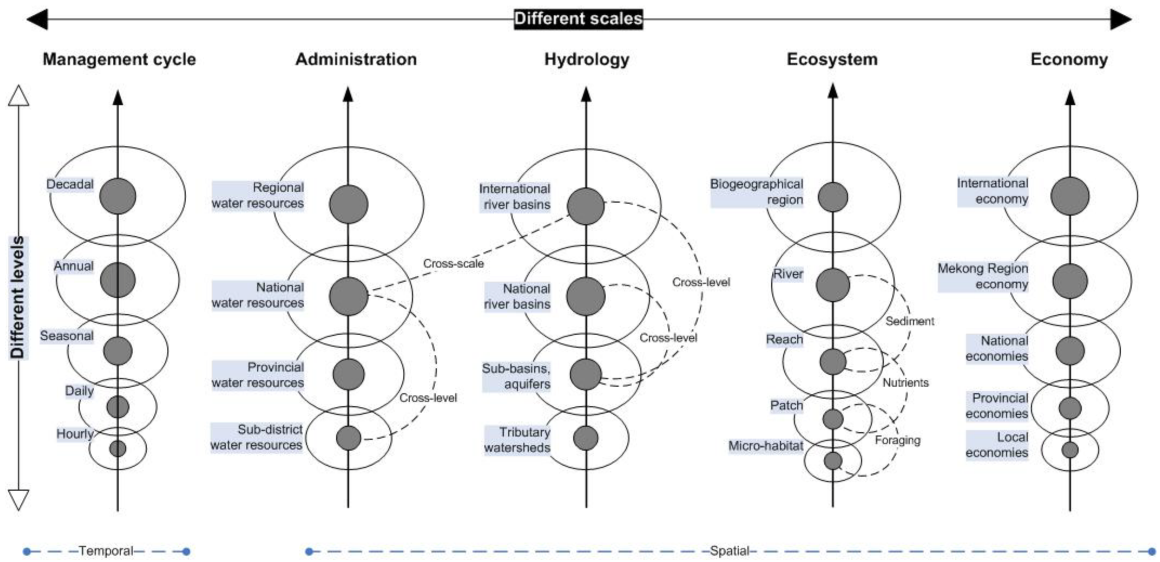


Figure 3.28 shows some examples of typical levels on five different scales (one temporal and four spatial). Examples of cross-level and cross-scale interactions are given for a pair of spatial scales. Some multi-level processes are shown on the ecological scale.

Actors contest scales and levels, overtly through debates, media releases, lobbying and protests, and more subtly, through use and control of technologies, indicators, deliberations over measurements and controlling political sites.. Thus, some actors push for hydrological scales – watersheds to river basins – as levels correspond to manageable units in their models or infrastructure they operate. Others promote conventional, area-based administrative hierarchies – districts to regions – arguing that this is where capacity, accountability and legitimacy already exist. Differences between administrative and hydrological scales, for example, are a common source of tensions in water resource governance.

Contests can arise in MSPs because different actors favour particular scales and levels in their analysis, arguments and responses. Convenors may take steps in selection of participants and format to ensure there are constructive exchanges and debate within and between relevant scales and levels.

The scales and levels used in an MSP should eventually be a joint product of biophysical and social processes. It is rarely possible, and probably undesirable, in an MSP being undertaken for a complex water issue, to be too strict, too early about scale and level choices.

The physics of flows, and the dynamics of ecosystems or social institutions can often be collectively better understood if scale and level boundaries are not overly constrained at the beginning of an MSP. For example, seasonal dynamics of flow regimes are important to fish (and thus fishers) on different temporal levels than the operational and planning logics of hydropower generation, irrigation and flood risk management.

"**CONTESTS CAN ARISE IN MSPs BECAUSE DIFFERENT ACTORS FAVOUR PARTICULAR SCALES AND LEVELS**"

3.2.4 Sufficient resources, political support, and time

Without adequate resources – human, financial, informational and intellectual – an MSP will not reach its potential. Competent people will be needed to support the operation of the MSP. Costs will be incurred and so funding needs to be organized. Uncertainties will need to be addressed with information and people that have the knowledge that can help to move forward.

It is vital that any MSP has sufficient political space and momentum to permit or encourage establishment and support. The need for some degree of political support is unavoidable. This does not just refer to political support from the State, but rather is a reminder that an MSP must have some type of supportive stakeholder constituency with either influence or authority. In the case of Cape York, Australia (see Case 3.2) the political support wavered, but endured for long enough to ensure the MSP was given a chance to make its best contribution.

"**IT IS VITAL THAT ANY MSP HAS SUFFICIENT POLITICAL SPACE AND MOMENTUM"**

Case 3.2 Breaking down the wall in Australia's Cape York

The MSP of CYPLUS (Cape York Peninsula Land Use Strategy) was born in the 1990s after 20 years of intensifying conflict about major development proposals, mining, land rights, cattle grazing and Aboriginal land rights in the Cape York Peninsula of north-eastern Australia. CYPLUS was an intensive and extensive MSP to develop a Cape York Land Use Strategy – not water-focused, but undoubtedly complex – in a remote area of northern Australia covering 137,000 km^2 but home to only 18,000 people, the majority of whom are of Aboriginal or Torres Strait Islander descent. All levels of government were actively involved.

People who studied CYPLUS were told by one participant: 'Before CYPLUS there was a brick wall between graziers (cattle farmers), greens and aboriginal people on Cape York – they were all trying to cut the Cape up into little pieces for themselves but there wasn't enough to go around. CYPLUS broke down the wall'. The researchers also warned of the need for a long-term commitment, which for CYPLUS was envisaged as at least 10 years, during which time there would be (in the Australian political system) 'at least three elections and countless changes in policies, programs and players involved in the effort'.[9]

The saying 'Rome was not built in a day' also applies to MSPs which require an investment in time and patience, some degree of continuity, and then follow-up. If the time allowed is too short, it is hard for an MSP to do its job. If the MSP is not followed up, or is not taken into account by decision makers, many participants will be disillusioned and re-engaging with them in the future will likely be more difficult.10 A key lesson noted by an observer of a Canadian MSP (see Case 3.3) was that: 'One of the main criticisms aimed at collaborative systems of governance is that whilst they provide opportunities for deliberation and wider participation in decision making, they often produce implementation failures because insufficient attention is given to outputs that will have an impact on the problem at hand. As a result, participants may lose enthusiasm for further collaboration if there is little sign of their efforts having a positive effect'.[11]

Case 3.3 Balancing power in the Fraser Basin Council in Canada

The Fraser Basin spans 13 watersheds in western Canada and supports more than 2.5 million people with an economy based on natural resources. The need for a more integrated approach to effectively and sustainably manage the land and water resources has long been recognized.

The Fraser Basin Council was established in 1997 as an MSP to pursue sustainable development through integrated river basin planning and management. It succeeded the Fraser Basin Management Programme, which was seen as being dominated by government interests.

The Council is a not-for-profit organization with a corporate structure that aims to address multi-jurisdictional issues to resolve disputes using a consensual rather than a legal or bureaucratic approach. It was specifically designed to complement, as opposed to duplicate, government management functions. A Charter for Sustainability was initially developed as a means of creating shared understanding among the diverse groups. The Charter outlines problems as well a vision, and articulates the values, principles and rules to guide collective action.

The institutional set-up of the Council was carefully crafted in order to create a space for equitable deliberative opportunity amongst diverse stakeholders to influence policy and programme decisions. It was recognized that a key challenge for collaborative governance is to provide fair representation, given that there are always economic and political power imbalances between groups that have legitimate interests in various facets of river basin management.

The Council included 36 directors drawn from three tiers of government (federal, provincial and local), First Nations, community groups, businesses as well as social, economic and environmental issues. To ensure fair local involvement, there were five regional committees for specific watersheds comprising of representatives from local government, First Nations and sectoral interests.

3.2.5 Politics and power recognized

When scoping an MSP it is necessary to consider politics and power explicitly.

Politics is a slippery concept. Comments from almost 50 years ago remain useful: 'Politics is about policy, first and foremost; and policy is a matter of either the desire for change or the desire to protect something against change' and 'Politics is a natural reflex of the divergences between members of a society… [where]… there is a variety of perpetual disagreements which arise from fundamental differences of condition, status, power, opinion, and aim'.12 Water sharing is not just about technical choices. Contesting different views is the realm of politics. MSPs are a place for this contesting. MSPs are one way of ensuring that political tussles include evidence and exploration of different values and perspectives.

"**WATER SHARING IS NOT JUST ABOUT TECHNICAL CHOICES"**

Another elusive concept is power. It can be seen as the ability to shape the context and conduct of others.13 This is helpful, but it only gets you so far. It is useful also, and very relevant to MSPs, to think of power in terms of assets and power relations (see Figure 3.3). Thinking of both can help in understanding the context.

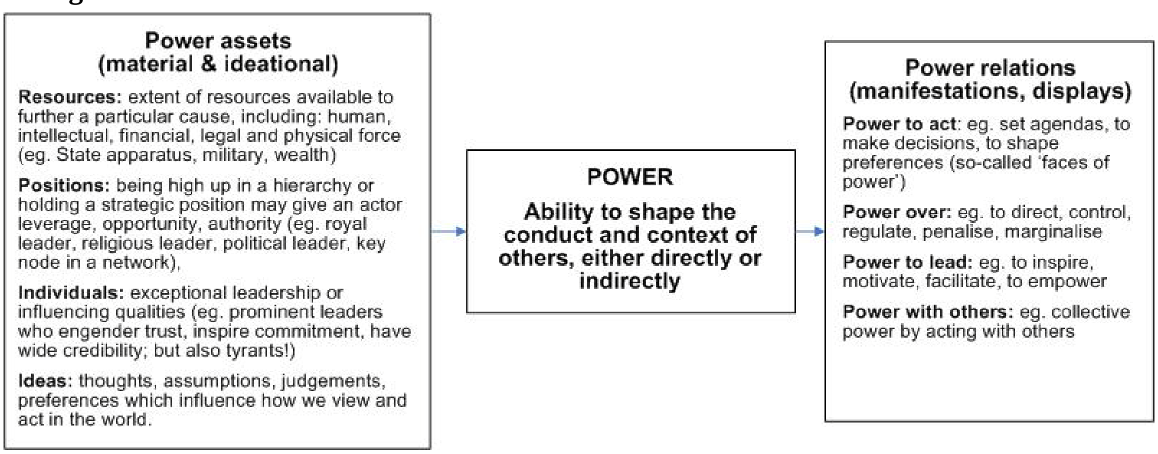
"**WHEN SCOPING AN MSP IT IS NECESSARY TO CONSIDER POLITICS AND POWER EXPLICITLY**"

MSPs are likely to be more influential if they are endowed with adequate helpings of 'assets' including: resources, participants in strategic positions, individuals with leadership ability, and a rich inflow of ideas.

For some, politics and therefore political analysis, is focused on an analysis of power – identifying and interrogating its distribution, exercise and consequences. How power relations are manifested is just as important as whether particular actors have power – 'power to act', power with others', 'power over' and 'power to lead'14 – all are important, as with the invocation of the wax, wick and flame metaphor in Box 2.1 in Chapter 2.. MSPs are more likely to be agents of constructive engagement if the power relations manifested are a healthy mixture of these different forms. Perhaps most important and integral to the success of MSPs is fostering the acceptance by many participants that there is new and additional power in collectively working with others.

"INTEGRAL TO THE SUCCESS OF MSPs IS FOSTERING THE ACCEPTANCE THAT THERE IS POWER IN COLLECTIVELY WORKING WITH OTHERS"

Figure 3.3 Power



3.3 Elements of good process

MSPs earn legitimacy, at least in part, by demonstrating high-quality process. To do so requires attaining and maintaining high standards of deliberation, facilitation, inclusiveness, information exchange and communication to the participants and wider constituency.

"MSPs EARN LEGITIMACY, AT LEAST IN PART, BY DEMONSTRATING HIGH-QUALITY PROCESS"

3.3.1 Deliberative

Deliberation is integral, by which we mean: 'deliberation is debate and discussion aimed at producing reasonable, well-informed opinions in which participants are willing to revise preferences in light of discussion, new information, and claims made by fellow participants. Although consensus need not be the ultimate aim of deliberation, and participants are expected to pursue their interests, an overarching interest in the legitimacy of outcomes (understood as justification to all affected) ideally characterizes deliberation'.15

MSPs are rooted in a belief in the value of 'authentic deliberation'16 between people with different perspectives. In this way, MSPs give privilege to the power of argument, explanation and reason over other types of power. Therefore, it is important to note that stakeholders who do not have language and communication skills can be disadvantaged, unless adequately represented.

"MSPs GIVE PRIVILEGE TO THE POWER OF ARGUMENT, EXPLANATION AND REASON OVER OTHER TYPES OF POWER"

3.3.2 Facilitated

To enable deliberation, good facilitation is an essential characteristic if MSPs are to reach their potential. Ideally in a group of MSP facilitators, there would be a mixture of men and women of varying cultural backgrounds, united by having open minds. These facilitators need to possess a reasonable share of the following traits:

Listener: Ability to listen and create an atmosphere where others will listen (not just talk).

Enabler: Ability to see who is participating and who is not, and to find ways to enable all participants to contribute in an authentic way. This includes stopping any particular individual or group from dominating an MSP.

Linker: Willingness to prepare by thinking through the programme and backgrounds of participants, anticipating what might happen. It is important the facilitator link the steps in the MSP process, maintaining some direction/focus, whilst also being adaptable to the needs of participants.

Respectful: Respect and empathy for different people and the different world views that they hold. This includes respect for different forms of knowledge – engineering, agriculture, ecology, economic, cultural, social, national politics, local villagers.

Energetic: To maintain the enthusiasm of the participants to persist and work through what may be difficult tasks, the facilitator usually requires large reserves of personal energy.

Familiarity with appropriate 'facilitator techniques'*: There are many techniques to encourage creative expression – such as buzzing, mind mapping, rich pictures. A skilful facilitator can draw on these as components of the MSP method.*[17]

"TO ENABLE DELIBERATION, GOOD FACILITATION IS AN ESSENTIAL CHARACTERISTIC"

3.3.3 Inclusive

MSPs should enable representation of a wide range of stakeholders and their disparate interests via a flexible process which may have many different facets. Inclusiveness implies being respectful of diverse ethics, ways of reasoning, world views and priorities of actors.

"MSPs SHOULD ENABLE REPRESENTATION OF A WIDE RANGE OF STAKEHOLDERS"

3.3.4 Informed and communicative

MSPs should use and share the best available information, building the knowledge base. MSP participants should become familiar with other relevant fora, plans, agendas etc. The MSP also needs to communicate effectively with the wider public sphere if it wishes to create and maintain a constituency.

"MSPS SHOULD USE AND SHARE THE BEST AVAILABLE INFORMATION"

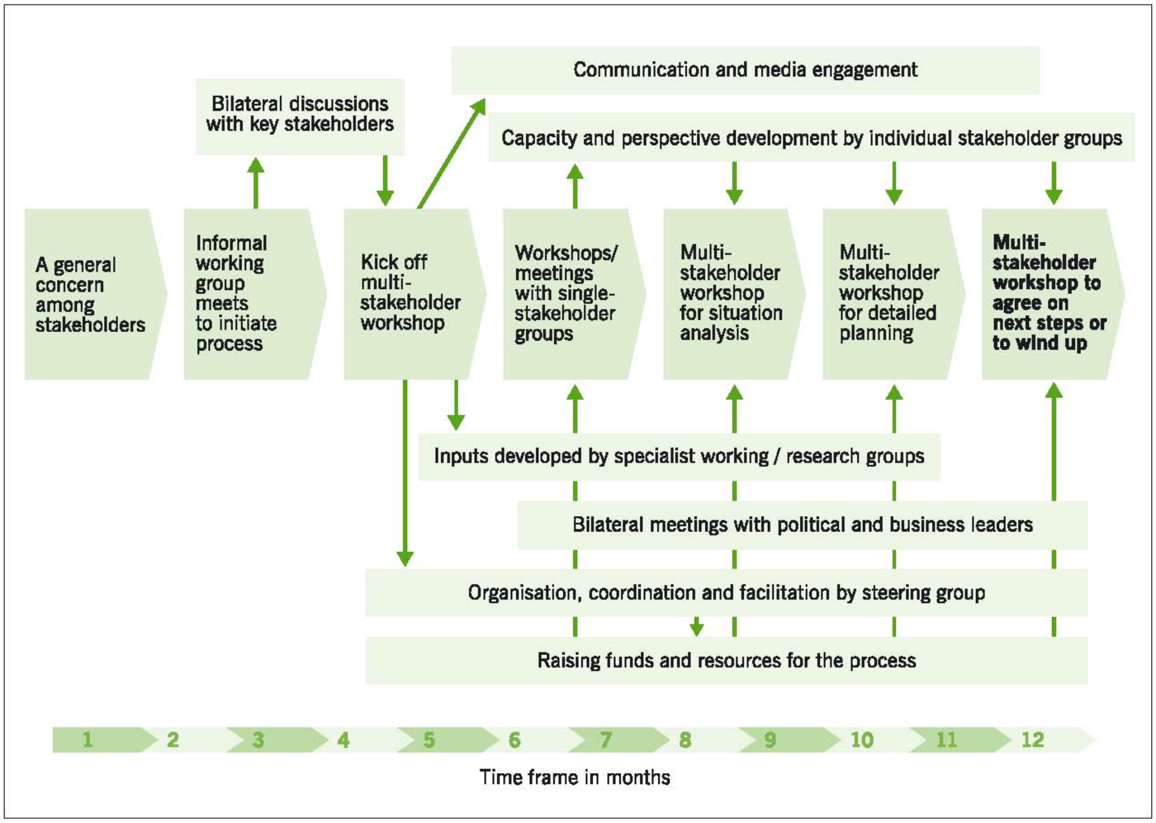
3.4 Desirable MSP content

MSPs are not all the same. Figure 3.4 provides a practical example of a hypothetical MSP which shows a plausible flow from acknowledgement of a concern through to deliberation and agreement on next steps.

MSPs may involve regular meetings between core participants. These might be informal gatherings beside an irrigation canal, next to a wetland, or on the banks of a river. There might also be conferences/discussions open to the wider public, locally hosted field visits, electronic exchanges, government briefings, films, plays, historical texts, testimony, or commissioned research.

Despite differences in the way they are set up and implemented, examples of desirable content can be suggested.

Figure 3.4 Timeframe and sequence of hypothetical MSP



Source: Vermeulen et al., 2008, page 57.

3.4.1 Setting up

Setting up refers to the practical steps that must be taken in establishing an effective MSP.18 Essential steps include:

- establishment of an interim MSP steering group;
- articulating clear rationale for MSP;
- building a constituency for the MSP;
- preliminary examination of the wider MSP context;
- assessing potential MSP designs and mandates.

<u>Establishment of an interim MSP steering group</u>

There are now hundreds of examples around the world of water-related MSPs. To get going has usually required an interim MSP steering group. Some say ‘interim’, others ‘initial’ or ‘informal’. Some prefer ‘working group’ or ‘committee’ to steering group. It’s important, though, not to get hung up at this early stage. The key is to start somewhere. Final convening, management and coordination responsibilities for the MSP are sorted out and adjusted during the setting-up phase.

Case 3.4 Improving agricultural knowledge, science and technology

A prominent recent example of an MSP was the International Assessment of Agricultural Science and Technology for Development (IAASTD).[19] This was a five-year process from 2003–2008. Whilst not focused on water, it is nevertheless an excellent example.

In the beginning a Steering Committee of 40 representatives from governments, agencies, industry, farmers and other rural producers, consumers, environmental and other NGOs produced a basic document in August 2003 calling for the International Assessment. They chose to address this question: How can we reduce hunger and poverty, improve rural livelihoods, and facilitate equitable, environmentally, socially and economically sustainable development through the generation, access to, and use of agricultural knowledge, science and technology?

A design process soon followed. The first meeting of the parties (governments), five co-sponsoring UN agencies, World Bank and civil society representatives took place in 2004. The government representatives (45 countries present) decided to go ahead with the Assessment. They agreed on the content and scope of the Assessment and adopted outlines and procedures, a timetable and a budget of US$ 10.7 million.

The process became a UN inter-governmental process, which means the participating member state representatives made the final decisions and were asked to adopt the final report. The initial Steering Committee morphed into a multi-stakeholder Bureau of 60 representatives of governments (30), civil society (22) and international institutions (8) to oversee the process.

The IAASTD then undertook a comprehensive global assessment, that included five more detailed sub-global reports, of the role of agricultural science and technology in development, culminating in a final plenary in Johannesburg in April 2008 at which synthesis reports and summaries for decision makers were presented to all stakeholders.

Articulating clear rationale for MSP

The need for an MSP has to be explained and accepted before people will agree to invest time and effort. What problems or opportunities will the MSP seek to address? How will an MSP fill a gap, or add value, to the existing efforts being made?

- Diverse goals have catalyzed recent local, national, regional and global MSPs, including:
- bringing some element of public deliberation into decision making about possible links between 37 major rivers across India (see Case 3.6);
- micro-watershed equitable sharing of irrigation water in the Lingmutey Chu Watershed, Bhutan (see Case 3.7);
- combining maintenance of the character of natural floods with hydropower generation in the negotiation of ‘environmental flows’ in the Senegal River Basin (see Case 3.9);
- energy future – using national follow-up to the World Commission on Dams to address controversies about building large dams in Nepal (see Case 3.10);
- better use and care for ground water in Umatilla County, USA;[20]
- Improving cooperation among interest groups and negotiating a water charter to guide land on water management in the Komadugu Yobe Basin of the Lake Chad, northern Nigeria.[21]

“THE NEED FOR AN MSP HAS TO BE EXPLAINED AND ACCEPTED BEFORE PEOPLE WILL AGREE TO INVEST TIME AND EFFORT”

Building a constituency for the MSP

To reach its potential an MSP needs a constituency of diverse supporters. Providing early opportunity for involvement is important. Although people may constructively engage for different reasons, most will want to be convinced that the MSP is a genuine and worthy effort to search for fair and effective ways forward. Building a constituency, means building a base of MSP supporters who are committed to engaging in a collective process. It is far more than ‘engaging with stakeholders’, or undertaking a ‘stakeholder analysis’ (discussed below).

“TO REACH ITS POTENTIAL AN MSP NEEDS A CONSTITUENCY OF DIVERSE SUPPORTERS”

Preliminary examination of the wider MSP context

The interim steering group needs to ensure that the wider MSP context is understood. Some call this the ‘operating environment’ or the wider ‘political economy’. It is important to get a basic overview of the present and relevant history, including an initial understanding of the range of perspectives of the MSP stakeholders. This will provide guidance on the areas to be explored in more detail.

Assessing potential MSP operating structures

There are usually various choices for an MSP operating structure which will determine function, legitimacy and credibility. Links to existing authority structures need to be clear. For example, what is to be the link to existing levels of government (if any)? Taking the time to investigate and introduce an appropriate structure is vital.

Assessing MSP designs and mandates

In the words of Jeroen Warner: ‘MSPs, by any other name, are currently “hot” in the water sector’ attracting diverse actors to operate collectively – at least for a time – in a ‘weird and wonderful panorama’ of different multi-stakeholder processes.22

That said, there are many choices for the design of an MSP, which must match the purpose and scope. The design includes operating structures and plans for carrying out the MSP. The setting-up phase is critical in negotiating appropriate designs, and mandates, so that the particular MSP can serve the needs of the part of society grappling with a particular issue, hoping to make water governance fairer and more effective via a well-intentioned platform.

3.4.2 Stakeholder analysis

Stakeholder analysis is essential to properly design and implement an MSP. It helps to clarify who to involve in an MSP and in what way. It should provide a foundation and plan for participation throughout the MSP making it easier for stakeholders to engage, be respected, and learn from each other.

MSP drivers – that is, the convenors, or steering group – must agree on criteria for determining stakeholders. For many MSPs, the 4Rs are a useful starting point. What are the benefits and who may be involved in reaping a reward or bearing a cost? What are the risks and who are the voluntary or involuntary risk-bearers? Who has or may claim a right to be involved, recognizing that some will always say their ‘right to participate’ is greater than others? Who has a responsibility to be involved – legal or perhaps because of ‘civic duty’ – given the insights they possess and may be able to contribute?

List all the people and organizations that might fit the criteria. The list may need to be revisited several times to ensure that all key groups and people are given the opportunity to engage, either directly or via representatives. Allowing stakeholders to self-nominate can also ensure that those with an interest are not excluded. Decisions need to be taken on how best to involve people. It is sensible to hear from all parties likely to be interested in the MSP so as to hear how they think they can be optimally involved in different ways.

Various tools can be used to learn about stakeholders and their relationships, such as: brainstorming, actor mapping, interviews with key informants or producing 'rich pictures' with focus groups.

It can be helpful to make a stakeholder matrix with the stakeholders along one axis and 4Rs criteria along the other (see Table 3.1).23 In complex situations, it is often the case that there are contesting views. It can help to use the 4Rs to research the roles of different stakeholders in the MSP key issues.

Cross-checking with different people can lessen the risk of oversights or bias. If not too provocative, it can also be useful to prepare preliminary summaries of the influence and authority of different actors. Recognizing the dynamism of actor relationships, it can also help to use the 4Rs to reflect on the power (influence and/or authority of different stakeholders).

"STAKEHOLDER ANALYSIS IS ESSENTIAL TO PROPERLY DESIGN AND IMPLEMENT AN MSP"

Table 3.1 Stakeholder analysis using the 4Rs in a hypothetical water project

4Rs ➔	Rewards – potential benefits	Risks – risks voluntarily being taken or involuntarily borne	Rights – rights claimed	Responsibilities – formal or informal responsibilities
Stakeholders (examples) 🡻	Examples of the rewards, risks, rights and responsibilities which should be explored during stakeholder analysis. 🡻			
Locally affected people	Local rewards need to be assessed. They could include: equitable access to quality water or related resources; compensation for loss of access to resources; cessation or redesign of	May be involuntary risk bearers. Examples include: negative impacts related to reduced quality or quantity of water or ecosystems; threatened livelihood security etc.	Right to free prior informed consultation. (Right to withhold consent is contested vigorously by state officials). Right to be made better off, or at least not worse off.	Recognition of the rights of others to try and improve their lives.

	project with impacts that are too negative.			
Developer	Profit from construction or operation of a new facility.	Construction cost over-runs, or unprofitable operation. Borrowing and investment risks.	As per authorized contracts.	Follow the laws. Full disclosure of all anticipated impacts. Construction and operation as per agreements.
Expert	Fees, sometimes future profit share.	Minimal, except for reputational if shown to be incorrect.	Right to provide unbiased advice for consideration by decision makers.	To operate within their fields of expertise, and to provide clear and impartial advice.
NGO representa tive	Often negligible, but as with others, this should be examined. Inclusion of issues they feel are important.	Risk of being marginalized from the political or legal process if not a directly affected person. Reputational, if seen to be engaging in a less than ideal MSP or of making too great concessions.	Right to explore, question and present their ideas and opinions.	Political accountability to their stakeholder constituency.
Financier	Return on investment.	Loss of investment.	To lend within the spaces provided within the law.	Due diligence, adherence to internal and industry policies, including codes of conduct.
Governme nt official	Benefits should be restricted to those to be enjoyed by wider citizenry.	Minimal, except for reputational if shown to support unwise or unfair development.	To discharge their duties as authorized and employed citizens.	Adjudicate wisely and fairly, upholding the spirit of just laws and guiding regulations.

3.4.3 Social contract between participants

The social contract is a summary of the rules of engagement in the MSP. A social contract24 needs to be established between the convenors and all stakeholder representatives, which requires reaching some workable agreement on purpose, scope, political space, resources, time and process so that participants in an MSP understand the roles and responsibilities of all.

Social contracts – which are also usually negotiated – should make the 'participation promise' clear, to lessen the chance of a mismatch between reality and expectations. For example, are stakeholder representatives being invited to:

- Come together primarily to build relationships and share information?
- Set the agenda for subsequent public or private sector action?
- To brainstorm and problem-solve?
- Join a consensus-building initiative?
- To provide recommendations, or to take decisions?

The social contract needs to be unambiguous and documented, such as for the global Hydropower Sustainability Assessment Forum (see Case 3.5).

"THE SOCIAL CONTRACT IS A SUMMARY OF THE RULES OF ENGAGEMENT IN THE MSP"

Case 3.5 The 'social contract' of the Hydropower Sustainability Assessment Forum

In 2004, the International Hydropower Association (IHA) adopted Sustainability Guidelines, followed in 2006 by the adoption of a Sustainability Assessment Protocol (SAP). During 2008–2009, the Hydropower Sustainability Assessment Forum (HSAF)[25] examined whether it is possible to establish a broadly endorsed sustainability assessment tool to measure and guide performance in the hydropower sector, based on the IHA's SAP. The HSAF included on-ground assessments and meetings in USA, Zambia, China, Brazil, Iceland and Turkey. In mid 2009 it released its draft Hydropower Sustainability Assessment Protocol (HSAP).

The Forum membership included representatives of developed and developing countries involved in hydropower as well as from the NGO, finance and industry sectors. At the beginning of the Forum, participants signed a Memorandum of Understanding and agreed to a detailed 'Communications and Operating Procedures' including, for example, that:

- the HSAF will be transparent, conducted with goodwill, and will search for consensus;
- where a consensus cannot be reached, the differences will be recorded and acknowledged in all HSAF documentation;
- the HSAF will only use the name and brand of participants in public communication after obtaining their permission;
- the decision on endorsement of the final product will be taken by each participant at the end of the process, after consultation with their respective constituencies;
- participants reserve the right to withdraw from the MSP during the process. If this action is taken, the withdrawing participant will provide a written explanation to the Chair.

"THE SOCIAL CONTRACT NEEDS TO BE UNAMBIGUOUS AND DOCUMENTED"

3.4.4 Comprehensive assessments

There are many deliberation-support tools that can be helpful when negotiating water-related resource use and further development. It is axiomatic that MSPs should strive to ensure a comprehensive, meaning 'sufficiently thorough', assessment of issues, informed by all stakeholders, and ultimately of use to them all. There is now extensive experience in undertaking MSPs that have a substantial knowledge assembly, contesting and building component.

Case 3.6 Civil society-led dialogue assessing river-linking schemes in India

River diversions and basin transfers are some of the most contested water issues globally.

India's mega Interlinking of Rivers (ILR) project has proposed to provide 173 billion m^3 of water to irrigate 37 million hectares through 31 links in Himalayan and peninsula rivers and associated large dams, reservoirs and canals.

Proponents argue the merits of diverting water from 'surplus' rivers to 'deficit' rivers to increase irrigation and thereby food grain production, mitigate floods and droughts, and reduce regional imbalance in the availability of water. Critics cite the negative ecological, economic and social costs, and argue for more effective ways to address food security.

A coalition of civil society groups, led by the World Wide Fund for Nature (WWF), initiated an MSP in 2003 to comprehensively assess the benefits and risks of the project, and explore alternatives to river linking. An initial working group, including civil society, government representatives, political leaders and media, spent eight months negotiating the set-up of the forum, and especially its members. The resulting 'National Civil Society Committee' (NCSC) was comprised of eminent persons representing diverse views. The NCSC was expected to: generate public debate; facilitate and improve information sharing between civil society and government; make available past knowledge and experience; and generate new knowledge about the project through independent studies.

The NCSC successfully raised public debate on the issue and influenced government to rethink its procedures and actions. Although the establishment of the forum took longer than anticipated, the credibility and legitimacy of the process was largely due to the diversity of perspectives represented and the comprehensiveness of the analysis.[26]

3.4.5 Scenarios

Scenarios are stories that outline possible futures. For complex situations with associated uncertainty, scenario building in an MSP can help all participants think laterally and learn about each others' different interests, values, priorities, assumptions, constraints and options.

Scenario analysis has a history going back to the 1960s in the military and business. In recent times, as both the pace of change and uncertainty has increased, there has been renewed interest in scenario analysis and planning.

The basic principle of scenario planning is to try and understand plausible future trends to help make strategic decisions based on an analysis of the possible consequences. Some form of scenario analysis is highly relevant to many MSPs (see Box 3.2).

Box 3.2 Steps used in scenario building

Step 1:	Identify driving forces – from whatever source: politics, economics, social or ecological change, technical breakthroughs etc.
Step 2:	Identify predetermined factors – assessing what is inevitable about the future.
Step 3:	Identify critical uncertainties – assessing those areas where the future is uncertain, which can be prioritized according to importance and degree of uncertainty.
Step 4:	Develop scenario storylines – a series of plausible alternative futures.
Step 5:	Assess the implication of different scenarios – for the issue(s), organization(s), place(s) or sector(s) of concern.
Step 6:	Identify and use indicators – to enable continual reassessment and adaptation.

Scenarios are an interpretation of the present as well as an image of a possible future. Qualitative scenario storylines should be internally consistent and describe paths from the present to the possible futures. Where data exists, quantitative modelling is a way of making scenarios more explanatory and coherent by making important connections more explicit.

“SOME FORM OF SCENARIO ANALYSIS IS HIGHLY RELEVANT TO MANY MSPs”

Formats and settings can be experimented with creatively. The Georgia Basin Futures Project, for example, drew on expert knowledge and community inputs to build tools and a game for exploring *what-if* type scenarios for a basin on the west coast of Canada. Visioning is commonly used in scenario building and decision making, for example by policy makers and youth in Europe,[27] and for much longer by indigenous people grappling with water sharing in the High Atlas mountains and Negev desert.[28]

Role-playing games can also help stakeholders explore each other’s perspectives on water management options. Case 3.7 introduces Companion Modeling, which combines role-playing games with computerized modeling to explore scenarios.

“VISIONING IS COMMONLY USED IN SCENARIO BUILDING AND DECISION MAKING”

Case 3.7 Companion Modeling

Companion Modeling combines role-playing games with computer model simulations to facilitate shared learning and explore scenarios in order to assist with collective decision making.

The approach has been successfully applied to resolve conflict amongst villagers on water allocation for rice irrigation in Bhutan and Thailand. Farmers in the Lingmutey Chu watershed in Bhutan played several sessions of the game to see the outcomes of various water-sharing strategies when applied both within their village and also in a collective approach between villages. Role swapping was particularly effective in building common understanding amongst participants of the situations of other parties.

The computerized multi-agent model allows rapid simulation of a more comprehensive set of scenarios of water sharing rules. It examines the interactions among different actors (or 'agents') and between these actors and the common resource to be shared. Researchers and participants can discuss the outcomes of the scenarios, and adapt the model so that scenarios genuinely reflect the on-the-ground situation.

Participants initially engaged in the games as an exercise, but soon realized the power of the tools for joint analysis of complex issues. Plenary discussions amidst the gaming sessions took the deliberations from simulation to reality. Villagers in Bhutan concluded their sessions with a formal agreement on how to allocate water more fairly, including the creation of a water management committee and steps to develop rules and procedures.[29]

Case 3.8 Scenarios in the Millennium Ecosystem Assessment

The Millennium Ecosystem Assessment (MA)[30] assessed the consequences of ecosystem change for human wellbeing. From 2001–2005, the MA involved the work of more than 1360 experts worldwide. Their findings provide a state-of-the-art scientific appraisal of the condition and trends in the world's ecosystems and the services they provide, as well as the scientific basis for action to conserve and use them sustainably.

The MA Scenarios Working Group considered scenario development as a tool to explore possibilities for the future that cannot be predicted by extrapolation of past and current trends.

The MA considered the possible evolution of ecosystem services during the 21st century by developing four global scenarios exploring plausible future changes in drivers, ecosystems, ecosystem services, and human wellbeing:

- The Global Orchestration scenario depicted a worldwide connected society in which global markets are well developed and where there is a high degree of global cooperation.
- The Order from Strength scenario examined a regionalized and fragmented world preoccupied with security and protection.
- The Adapting Mosaic scenario explored a fragmented world resulting from discredited global institutions, in which local ecosystem management strategies are evolved and adopted by strengthened local institutions.
- The TechnoGarden scenario was characterized by a globally connected world relying strongly on technology and highly managed and often-engineered ecoystems to deliver needed goods and services.

Wetlands and water was a key part of the MA analysis, and many evidence-based key messages were distilled for policy makers. For example, noting and exploring the policy decisions that have to be made involving trade-offs between agricultural production and water quality, land use and biodiversity, water use and aquatic biodiversity, and current water use for irrigation and future agriculture production.

3.4.6 Selective use of tools

There are many tools to support water negotiations, including the previously introduced stakeholder analysis, comprehensive assessments and scenarios. Other tools are explored in companion books to NEGOTIATE, such as FLOW, PAY, SHARE and RULE.31

FLOW introduces the user to the essentials of environmental flows. Implementing 'environmental flows' requires establishing water flow regimes which recognize ecosystem needs whilst trying to satisfy social and economic demands (see Case 3.9). FLOW explores how societies define flow requirements, modifications that might be necessary to infrastructure design and operation, finance and incentives, policy and legal frameworks, and the necessity to generate and maintain political momentum. Environmental flows work requires the integration of a range of disciplines including engineering, law, ecology, economy, hydrology, political science and communication. An MSP approach is very suitable for informing the negotiations and decision making about how humans interfere with natural flow regimes.

Case 3.9 Negotiating environmental flows in the Senegal River Basin

Transboundary cooperation in the Senegal River Basin is led by OMVS (The Senegal River Basin Development Organisation) which provides a forum for joint efforts by Mali, Mauritania and Senegal (and recently, upstream Guinea) to respond to development challenges while operationalizing integrated water resource management.

In 2002, the OMVS member countries adopted the first-ever River Basin Water Charter in sub-Saharan Africa, which was preceded in 2000 by the establishment of an Observatory of the Environment responsible for monitoring the state of the environment in the basin and impacts of development interventions. The Charter and Observatory were the culmination of a two-decade long process marked by studies and debates on optimal ways of managing the river waters and investing in major water infrastructure projects.

The objective of the Charter is to provide for efficient allocation of the waters of the Senegal River among many different sectors, such as domestic uses, urban and rural water supply, irrigation and agriculture, hydropower production, navigation, fisheries, while paying attention to minimum stream flows and other environmental matters. It also establishes a process for approving new projects that may have significant impacts on those sectors, based on the provision of information to and consultation with all riparian stakeholders, including local users.

The Charter drew on comprehensive analysis of the effects of the Diama and Manantali dams and exploration of alternatives to their current operation. The studies revealed the considerable and diverse benefits of the natural flood system – in terms of wetlands, fisheries, agriculture, livestock, forestry and groundwater recharge – benefits which needed to be factored into the operation of the dams and in planning of future development interventions. This was particularly essential since the majority of those affected rely heavily on the exploitation of water-dependent natural resources (traditional agriculture, fisheries, livestock, and exploitation of forest and wetland products).

As a result, the Water Charter includes specific provisions for the release of water from the dams to help restore the floodplains and generate an annual flood, thereby recognizing the value of the floodplain ecosystem and traditional livelihood strategies.[32]

3.4.7 Action recommendations

MSP content must provide action recommendations. There is no need to manufacture consensus if it cannot be reached, but workable recommendations for forward action must be sought, otherwise the MSP might end up being nothing more than an interesting discussion. If empowered to do so, the MSP might also take and implement decisions, but this is dependent on the extent of the mandate.

The World Commission on Dams (WCD) (see Case 3.10) is an example of an MSP that provided extensive action recommendations, without claiming decision-making authority.

“WORKABLE RECOMMENDATIONS FOR FORWARD ACTION MUST BE SOUGHT”

Case 3.10 World Commission on Dams

Don't plan, build, protest, operate, decommission, propose, oppose or discuss a dam without it! By 2000, the world had built 45,000 large dams to irrigate a third of all crops, generate a fifth of all power, control floods in wet times and store water in dry times. Yet, in the last century, large dams also disrupted the ecology of over half the world's rivers, displaced over 40 million people from their homes and left nations burdened with debt (Earthscan advertizing material promoting the WCD report)

The World Commission on Dams (WCD) was a high-profile MSP which emerged from increasing public criticism of large dams. It aimed to undertake a rigorous, independent review of the development effectiveness of large dams, to assess alternatives and propose practical guidelines for future decision making. The WCD attempted to conduct an ideal, deliberative multi-stakeholder learning process. Government participated, but with the same standing as civil society. There were many actors involved at the local, regional and international level – dam 'practitioners', economists, sociologists, ecologists, political scientists and the media. The process received enormous publicity and international recognition. In its own words it 'provided a unique arena for understanding complex choices facing societies in meeting their water and energy needs'.

The WCD commissioners produced a 'consensus' report, an informed and negotiated contribution, which was launched in a blaze of publicity in 2000, evoking a range of responses.[33] The 'WCD decision-making framework' has since been evaluated for use as both an implementation and advocacy tool. It is complex. The framework includes three grounding global norms, five core values, five key decision points, seven strategic priorities, 33 associated policy principles, and 26 guidelines. The task of trying to figure out how to combine these pieces of advice remains a challenge for post-WCD activity.

Following the release of the WCD report, there were numerous follow-up activities, including MSPs, undertaken around the world. The Dams and Development Dialogue in Nepal[34] is just one example where diverse stakeholders assembled and persisted over several years to explore sensitive large dam issues in the Nepal context.

3.5 Outcomes and impact

There is a suite of desirable outcomes possible from MSPs that successfully manage to read and respond to the context, establish a fair and safe process, and generally display the desirable characteristics outlined in the preceding sections.

In some places, the MSP approach has already become routine behaviour, but in other places an MSP is a new possibility. In an example from Peru, it is claimed that an MSP has provided a positive and 'unprecedented' experience: 'The multi-stakeholder platform is an unprecedented mechanism in the country. Throughout its history, Peru has developed a culture based on confrontation rather than one based on negotiation. Therefore, experiences such as that of Yakunchik imply "learning to negotiate" after a long tradition of domination, submission and violence'. (The MSP 'Yakunchik', after the Quecha word for 'our water', was established at the end of 1998 in the central highlands of Peru). It was further claimed that: 'As a result of the platform's initiatives, irrigation has been placed on the regional agenda, and has led to the discussion of other issues such as the rural-urban relationship, conflict negotiation, organizational and institutional water management-related problems, and rural development. In other words, the platform is contributing not only to the development of a new social fabric, but also to activating the agenda of regional development'.35

There is no attempt here to claim that all MSP experiences have been positive, but lessons have been learned, and there is sufficient evidence from around the world to conclude the following:

- MSPs can lead to the expansion of representation and participation of stakeholders in governance, potentially increasing the legitimacy of public decisions.
- MSPs can provide greater opportunity for discourses and norms to be launched and contested, ensuring that new and old perspectives are examined on their merits.
- MSPs can assist in the recognition and understanding of interdependencies. Societal learning about interdependencies is vital among stakeholders who will often have different values, motivations, perceptions and priorities.36
- MSPs enable reflection by representatives of various constituencies, clarification of existing accord and differences among stakeholders, and collective sense making.
- MSPs can help deliberation become routine, enabling complex issues to be more rigorously examined.
- MSPs increase the prospects of negotiations being more informed.
- By providing a pathway for deliberation, MSPs can lead to better decisions, agreements and implementation.

3.6 More potential, without claiming to be a panacea

MSPs can be a valuable, collaborative addition to water governance when the issues are complex. It needs to be stressed that MSPs are a complement to other forms of governing, not a replacement, and not a panacea. There is potential for their wider use.

Establishing the link between the policy-informing and decision-searching processes of an MSP and policy making and decision taking remains a skilled task. However, by favouring deliberation, MSPs can give people of goodwill a better chance to constructively influence decisions that affect their lives.

Chapter 4 provides guidance on consensus building, an elusive but key element of MSPs. The construction and operation of MSPs, and the pursuit of consensus building, are central pillars of constructive engagement, improving negotiations, and a move towards fairer, more effective water governance.

"MSPs ARE A COMPLEMENT TO OTHER FORMS OF GOVERNING, NOT A REPLACEMENT, AND NOT A PANACEA"

CHECKLIST

- Does the issue or problem warrant the extra effort of an MSP approach? If so, proceed but keep in mind context, process, content, outcomes and the impact sought. Figure 3.1 provides a guide.
- Consider the 4Rs as a way of focusing the MSP: rewards, risks, rights and responsibilities.

- Be clear about the purpose and scope. Ensure the convenors are credible and competent. Pay particular attention when setting up the MSP and negotiating the social contract – or rules of engagement – with all participants.
- Determine the appropriate scales and levels. Pursue sufficient resources, political support, and time.
- Recognize and attempt to understand the surrounding politics and power relations. Strive for a process which is deliberative, facilitated, inclusive, informed and communicative.
- Content can vary enormously but Figure 3.4 provides a guide. Content can include interactive stakeholder analysis, scenario-building and assessments. Judgement should be exercised as to how comprehensive assessments should be.
- The MSP should be clear on its audience, decision-makers and aim to provide action recommendations.

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[1] Hemmati (2002).

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[2] For a good discussion on influence and authority see Conca (2006).

[3] The figure guiding the chapter uses earlier work on MSPs by Dore (2007) and relates it to outcome mapping by Earl *et al*. (2001) and re-presentation of this mapping by Ricardo Wilson-Grau (unpublished). This latter conceptualization introduces 'spheres of control' that are useful to keep in mind when considering the possibilities and limitations of MSPs. The core of this outcome mapping approach is the focus on the importance of changing the social behaviour of actors. Context is only partially within the control of the MSP, as context is partly inherited. Process, content and outcomes are within the control of the MSP and its participants. Impact (higher-order than outcomes) is usually dependent on changing the behaviour of actors beyond the MSP participants.

[4] See IIED and WBCSD (2002) and NEGOTIATE case study on the IUCN Water website: O*k Tedi and Fly River negotiation over compensation: using the mutual gains approach in multi-party negotiations* by Barbara Sharp and Tim Offor.

[5] Clarifying scope and purpose is also key in a framework for 'water management hierarchies for adaptive management' which looks at levels, perceptions, tools, actors and institutions, see Pahl-Wostl *et al*. (2007). The work of Pahl-Wostl *et al*. has departed from network studies by Kickert *et al*. (1997).

[6] For a summary of a Mekong MSP see IUCN *et al*. (2007).

[7] The section on scales and levels is adapted from Dore and Lebel (2009) who drew on earlier work of Lebel, and that of Gibson *et al*. (2000) and Sneddon *et al*. (2002).

[8] Dore and Lebel (2009).

[9] Mobbs and Woodhill (1999). For greater detail about CYPLUS, see Mobbs (2000).

[10] A case on an MSP for a water and sanitation project in Bolivia illustrates the importance of timing to enable MSP recommendations to be acted upon (see *A Multi-Stakeholder Platform to solve a conflict over a Water and Sanitation Project in Tiquipaya, Bolivia* by Vladimir Cossio on IUCN Water website).

[11] The Case about the Fraser Basin Council is a summary derived from Watson (2008) that also provides this quote. More background information can be found at http://www.fraserbasin.bc.ca/

[12] Miller (1962).

[13] Hay (1997).

[14] VeneKlasen and Miller(2002).

[15] Chambers (2003).

[16] To the deliberative democrat, Dryzek, deliberation is 'multifaceted interchange or contestation across discourses within the public sphere', see (2001) where discourses are seen as 'shared sets of assumptions and capabilities embedded in language that enables its adherents to assemble bits of sensory information that come their way into coherent wholes' (1999:34). MSPs provide a mechanism for such 'contestation across discourses'. In so doing, they are in accord with the social learning perspective, the 'building blocks' of which are: the constructivist paradigm, an orientation towards reflection and action, and commitment to a holistic approach, see Maarleveld and Dangbegnon (2002). Just as MSPs are diverse in their purpose and emphasis, so too is the 'broad church' of constructivism which 'both seeks and serves to restore politics and agency to a world often constituted in such a way as to render it fixed and unyielding' (Hay, 2002). So it can be seen that the deliberative democrats, the social learning school, and constructivists, have much in common. Each emphasize the role of ideas as significant in reshaping the world.

[17] Wageningen International in The Netherlands maintains a very helpful MSP portal which includes excellent information about techniques, but also a regularly updated compilation of experiences from around the world.

[18] The text on setting up, stakeholder analysis and scenarios draws heavily on Dore *et al*. (2000).

[19] http://www.agassessment.org/

[20] See NEGOTIATE case study about Umatilla ground water on IUCN Water website.

[21] See NEGOTIATE case study about KYB on IUCN Water website.

[22] See Warner (2007). This quote is taken from the preface to this highly relevant book which provides 16 chapters exploring water-related MSPs from all corners of the world.

[23] Bird *et al*. (2006) have also proposed using a matrix to explore rights, risks and responsibilities.

[24] The notion of the social contract for the participants is similar to the IAP2 'promise to the public' (discussed in Chapter 2). An elaboration of this typology – looking at whether participants are invited to speak based primarily on their knowledge and skill (experts?), or based on their capacity to commit (authority?) or significantly influence the commitment of a constituency – can be found in Susskind *et al*. (2003).

[25] http://www.hydropower.org/sustainable_hydropower/HSAF.html

[26] See NEGOTIATE case study on the IUCN Water website: *Interlinking of Rivers in India: Dialogue and Negotiations by National Civil Society Committee* by Biksham Gujja, and Alagh *et al*. (2006).

[27] See NEGOTIATE case study on the IUCN Water website: *Visioning on the future of the rivers Scheldt and Waal* by Jeroen Warner.

[28] Wolf (2000).

[29] See NEGOTIATE case studies on the IUCN Water website: *Sharing Irrigation Water in Bhutan: Companion Modeling for Conflict Resolution and Institution Building* by Gurung *et al*.; and *Using Companion Modeling to level the playing field and influence more equitable water allocation in northern Thailand* by Barnaud *et al*. See also *Building Shared Understanding – Use of role-playing games and simulations to negotiate improved water management in the Republic of Kiribati* by Natalie Jones.

[30] http://www.millenniumassessment.org/en/Index.aspx. For the conceptual approach and detail of the MA scenarios, see Millennium Ecoystem Assessment (2005b), with particular attention to Chap. 8 by Cork *et al*. Water and wetland findings and recommendations are synthesized in Millennium Ecosystem Assessment (2005a).

[31] *FLOW* by Dyson *et al*. (2003); *PAY* by Smith *et al*. (2008); *SHARE* by Sadoff *et al*. (2008). All available at http://www.iucn.org/about/work/programmes/water/wp_resources/wp_resources_toolkits/index.cfm. *SHARE* provides a practical guide to water sharing across boundaries (or borders), with a focus on the 260 river and lake basins shared worldwide by two or more countries. It explores potential costs and benefits of cooperation, and of non-cooperation, and principles and mechanisms for incentive creation and benefit sharing. Transboundary negotations about water are an important issue between States. An infusion of deliberation, whether multi-stakeholder or not, would often improve the basis of negotiations and decision making. *PAY* provides ideas about payment systems that can be established to maintain or restore watershed services critical for downstream water users. When upstream services are valued, it provides an incentive for market systems to be explored as one way of encouraging land and water use that meets the needs of more than just upstream users.

[32]Thanks also to Madiodio Niasse of the Global Water Partnership for contributions to this case. For more information see the Senegal contribution to the 1st World Water Development Report (OMVS, 2003).

[33] There was a huge knowledge base assembled and debated by the WCD platform which informed the final report of the Commissioners (WCD, 2000). All reports, including details of the process, can be found online at www.dams.org. Critiques abound, but any reviewer of this process should include Dubash *et al*. (2001).

[34] Dixit *et al*. (2004).

[35] Luis Suberon, quoted by Ore (2007).

[36] In the words of one MSP researcher: ‘If there is not a full recognition of interdependence by stakeholders, including water bureaucracies, and the need for concerted action, MSPs will remain paper tigers’ (Wester *et al*. 2007).

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Scenarios as boundary objects in the allocation of water resources and services in the Mekong Region

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Introduction[1]

Scenarios are internally coherent stories of the future. As such they are an important tool for long-term planning and policy. They can be qualitative or quantitative, look forward or backwards and be constructed at different scales (van Notten et al. 2003). Scenarios have been widely used in business and the military to plan in situations of high uncertainty with respect to opportunities and threats (Masini and Vasquez 2000, Neumann and Overland 2004). More recently scenarios have been used in studies of environmental change, natural resources management and development to understand dynamic vulnerabilities and explore alternative, long-term, policy responses (Gallopin et al. 1997, Wollenberg et al. 2000, Peterson et al. 2003, Swart et al. 2004, Millennium Ecosystem Assessment 2005).

[1] This paper is intended for submission as a chapter in a book on long-term policies.

Scenarios can be understand as learning processes or products (Hulme and Dessai 2008, O'Neill et al. 2008). Emission scenarios in the IPCC process have been crucial foundation to understanding and communicating possible future changes to climate (IPCC 2007). In the Millennium Ecosystem Assessment process, for example, scenarios were seen as helping with education, communication, and decision-making (Millennium Ecosystem Assessment 2003). Strong engagement of stakeholders in construction and interpretation of scenarios in the sub-global assessments enhanced mutual learning about interests, capabilities and beliefs (Lebel et al. 2006, Lebel and Bennett 2008).

Scenarios and associated mathematical models – including, the graphs, maps, images and figures used to summarize their outputs – may function as boundary objects. A boundary object is an artifact which serves as interface among different communities of practice (Star and Griesemer 1989, Guston 2001). In climate science, for instance, the parameterizations of new model components are boundary object structuring the relationships between modelers and observers of climate change (Sundberg 2007).

In scenario planning constructing storylines requires people with different viewpoints and knowledge to work together. Quantifying parts of a scenario using models again demands that scenarios do boundary work between more holistic qualitative experts and modelers. Scenarios as products may also be objects around which experts, policy-makers and other stakeholders discuss implications (Garb et al. 2008). The IPCC's emission scenarios, for example, are a result of both science and negotiation. They are boundary objects around which scientists and policy makers have come together constructing and refining individual scenario storylines and sets (Girod et al. 2009).

Boundary objects, as devices supporting research-action arenas (van Kerkhoff and Lebel 2006) and assessments (Cash and Moser 2000), can help bring different forms of knowledge together and lead to co-production of new knowledge. Scenarios used iteratively are potentially important tools for long-term, adaptive and reflexive policy-making (Voss et al. 2009), especially, where they are seen as objects to support deliberation rather than a substitute for politics or for over-riding differences in world views (de Vries and Petersen 2009, Meadowcroft 2009).

This paper is a review of how scenarios have been used to address allocation of water resources and services in the Mekong Region. We focus on regional applications with a significant international component often contrasting the use of scenarios by the Mekong River Commission (MRC) and partners with possibilities suggested by other studies (Table 1). The scenario studies considered in this paper varied in several important dimensions. Most had a strong emphasis on qualitative models and only a few on developing full, qualitative, story lines. Most were built by experts, sometimes with consultation with a relatively narrow group of peers, and only a few with a broader range of stakeholders. The next four sections analyze these Mekong experiences, in turn covering: how scenario exercises start, how scenarios are made and used, and the influence of scenarios on learning and decisions.

Table 1. **Main scenario studies explored in this paper**

Scenario study	Convener	Number of scenarios	Participation in construction	Quantitative models	Qualitative story lines
OPTIM - Water Allocation Scenarios (Ringler 2001,	IFPRI & Bonn University	4	No	Yes	Basic

Ringler and Cai 2006)					
WUP - DSF evaluation scenarios (MRCS 2008)	MRC	7	No	Yes	None
BDP1 – Development scenarios Phase I (MRC 2005)	MRC	5	Narrow	Yes	Basic
IBMF3 – Flow scenarios (MRCS 2008)	MRC	4	No	Yes	Basic
MWRAS - Mekong Water Resources Assistance Strategy Scenarios (World Bank 2004, World Bank and Asian Development Bank 2006)	World Bank & ADB	6	Narrow	Yes	Basic
BDP2 - Development scenarios Phase II (MRCS 2008)	MRC	9	Narrow	Yes	Basic
HYDRO – Hydropower dams (MRC 2008b)	MRC	6	Narrow	Yes	Basic
WUP-FIN - Policy Scenarios (MRC and WUP-FIN 2006, 2008)	Finnish Research Consortium for MRC	4	No	Yes	Basic
UPLAND - Upland development alternatives in Montane Mainland Southeast Asia (Lebel 2006, Thomas et al. 2008)	Chiang Mai University	4 (4)	No	No	Elaborate
NSEC - North-south economic corridor project scenario (Foran and Lebel 2007)	M-POWER network & Chiang Mai University	4 (8)	Broad	No	Elaborate
CSIRO - Impacts of climate change on Mekong River Basin water resource (Eastham et al. 2008)	CSIRO	2	No	Yes	None

TKK - Climate change assessment (TKK and SEA-START RC 2009)	Helsinki University of Technology & Chulalongkorn University	3 (3)	No	Yes	None
FISH - Hydrological scenarios and fisheries (Baran et al. 2007)	WorldFish	4	No	Yes	Basic

Initiation

Scenarios are made for different reasons and in varied circumstances. During the last decade in the Mekong Region most exercises have been, one way or the other, concerned with the opportunities and risks from investments in large-scale infrastructure, including, dams, diversions, inter-basin transfers, flood embankments, irrigation schemes, transmission lines and road networks.

Mekong River Commission initially constructed a set of "development scenarios" after the completion of the Decision Support Framework (DSF) in March 2004 as part work carried out under the Water Utilization Program (WUP). The original seven scenarios (WUP-DSF,Table 1) were constructed primarily to evaluate and test the DSF. Several scenarios addressed indicators relevant to articles in the 1995 Mekong Agreement, in particular, minimum dry season flows (Article 6A), Reverse flow in Tonle Sap in wet season (Article 6B) and average daily peak flows in the flood season (Article 6C). Subsequently the set was revised to meet different, but often closely related objectives.

A World Bank (2004) study released in November 2004 evaluating and using the DSF models aimed to "*demonstrate the likely impacts of a credible variety of single- and multi-sectoral development scenarios*" (MWRAS, Table 1). The report is clear that the aim was not to evaluate individual projects or merits of a specific development scenario. The key conclusion from this study was that "*there is scope for significant levels of co-ordinated development with associated benefits to all basin countries*."

Phase I of the Basin Development Plan (BDP) focused on investigating hydrological and environmental impacts of a range of development alternatives (MRC 2005). Scenarios were released in May 2005 to assist with strategic planning (BDP1, Table 1). The focus was on hydropower and irrigation as two sectors expected to have significant effects on mainstream flow. Lack of sufficient consultation with member countries created some difficulties in understanding the purpose use of scenarios as well as the relationship between basin-wide and sub-area activities (MRC 2006a). Scenario planning was not a conventional practice in the respective national bureaucracies.

According to Dr. Vu Van Tuan team leader of the MRC's Basin Development Programme at the MRC Secretariat scenarios were being used in the development plan to "*investigate the likely development space within which the LMB will operate over the next 20 years, based on national policies and plans, demographic trends and market demands, as well as external factors such as the impact of development in the Upper Mekong*" (Tuan 2007). This reflection is fairly similar to the declared purpose of the World Bank (2004) study which pre-empted the BDP scenarios (Table 1).

In phase II of the BDP the basin-wide scenario exercise continues to focus on existing, planned and potential significant, large scale, water resources development projects over the next 20 years (MRC 2006b). The emphasis remains on projects which have trans-boundary impacts or benefits.

Over-time the MRC has made more explicit references to the boundary functions of scenarios. A plan for scenario-based impact assessment report presented in October 2009 meeting stated the main aims were to "*facilitate basin wide stakeholder discussions, government consultations and the detailed evaluations that each country must undertake to define the range of 'acceptable trade-offs', and ultimately assist in the preparation of the Basin Development Strategy, in particular the definition of the 'development space' and the strategic guidance for the integrated development and management of the various water-related sectors*" (MRCS 2009).

Apart from the MRC several other groups in the region have under-taken scenario-based analysis (Table 1). These have been less driven by treaty obligations or immediate policy or investment demands and as a result are a much more diverse group.

Several studies were explicitly designed to look at effects of climate change on water resources and agriculture (TKK and CSIRO, Table 1). Two larger ones are highlighted here. The study by Helsinki University of Technology and START Regional Center at Chulalongkorn University "*aims to contribute to the discussion about the climate change-related impacts and adaptation strategies*" (TKK and SEA-START RC 2009). Another study by CSIRO "*investigates how the climate is likely to change in the Mekong Basin by 2030, and quantifies the uncertainty around future climate projections*"(Eastham et al. 2008). Both studies refer to but do not attempt to directly incorporate interactions with MRC's development scenarios.

Several other studies listed in Table 1 arose, at least in part, out of concerns about impacts on fisheries (OPTI, FISH, WUP-FIN). Two other scenario exercises (UPLAND, NSEC) were triggered by concerns about livelihoods and ecological conditions in upper tributary watersheds in the Mekong region, an areas largely ignored in other basin-wide scenarios and impact assessments accept as drivers in changes in flood risk in downstream areas.

All scenario studies included an element of demonstration about them from outset– they were not thought of as definitive exercises. This was a particularly prominent rationale of the initial MRC models (WUP-DSF), economic scenario study (OPTI) and upland multi-level analysis (UPLAND). Another commonly shared element across many scenario studies was a stated concern with issues of poverty alleviation and regional development. These two common features enhance the potential of scenarios to perform boundary work among different social groups both in construction and exploration.

Construction

How scenarios are made varies. Important dimensions include the emphasis placed on storylines and model quantification and the level of participation or who is involved. When participation is extensive the distinction between making (construction) and using (exploration and communication) of scenarios is less useful. Most scenario processes have an iterative history and this can also lessen the separation between making and using. The vast majority of scenarios in the Mekong Region have been constructed primarily by experts, including consultants, often under the guidance of state officials.

Basin development plans

In the MRCs' work, scenarios have been seen essentially as alternative hydrological model runs with inclusion of a particular set of existing and possible future infrastructure. Adding, dropping and adjusting individual scenarios from the set is straightforward and has happened regularly as different interests have stepped up to shape the boundaries of assessment and analysis. The initial set of development scenarios arising from the WUP program, for example, consisted of seven scenarios (WUP-DSF), the World Bank mission study (MRWAS) a related but different six, and the BDP settled on 5 (BDP1, Table 2). The third phase of the Integrated Basin Flow Management adopted a subset of four from the BDP1 set, renaming some to more neutral terms (IBFM3, Table 2). A consultation process with the hydropower program used yet another set (HYDRO, Table 2). At a regional consultation workshop in October 2009 a total of nine scenarios were listed and references made to additional work on climate change yet to be included (MRCS 2009). The plethora of scenarios used within MRC activities creates an additional layer of complexity,

Control of how scenarios are constructed has a technical as well as rhetorical significance. Consider the labeling of scenarios and sets in the MRC series. The prefix “definite future” and “likely future” are used to label particular sets of scenarios (BDP2, Table 2). In some applications it is “Chinese dams” in others it is “Upper dams”. Different numbers of dams are called “low development” or “high development” (MWRAS, BDP1, Table 2). Moreover, irrigation and flood protection issues are labeled distinctly from considerations focused on hydropower energy “development”.

There has been substantial controversy over the content of the scenarios, for instance, how operating rules are set for these dams is likely to be crucial to their flow effects, but information about those assumptions has not been made public. Another debate is what should constitute “baseline”. Scenario-builders and users who wish to downplay effects of infrastructure overall have tried, for example, to shift the baseline to include already constructed mainstream dams in China.

The sequence with *which* infrastructure is also very important for impacts on flows and thus ecosystems sensitive to changes in seasonal flood regimes. Somewhat extraordinarily much of the scenario and modeling analyses carried out in the MRC series gloss over the dynamic time dimension of impacts of cumulative additions of infrastructure. Indeed consideration of these is often eliminated by comparing scenarios which are run for different lengths of time. Explicit storylines would help guide modeling of developments in the basin more explicitly and help reveal assumptions about interactions between infrastructure that now remain hidden.

Another important constraint in the MRC scenario exercises is the ‘requirement’ that some aspects of the scenario work be approved by member countries – for instance the hydrological model set in DSF have been formally approved but not some of the tools critical for socio-economic assessment or models used in geographically more restricted analyses. As a consequence work done by the secretariat is not done with best available methods. Some amount of exploration appears to proceed regardless of “formal” approval suggesting that scenarios also play an important preparation role to formal negotiations among states.

Despite these limitations the persistence of scenarios in basin development discussions illustrates their utility to key actors. Scenarios are flexible and ambiguous enough that they can meet certain range of objectives easily; in short, they do some boundary work useful to those engaged in the process. One of the problems was that until the 2nd phase of BDP wider stakeholder consultation on the development scenarios had been quite limited.

Table 2. A selection of storylines from scenario exercises. Short study titles as in Table 1. Storylines for two scenario sets are presented in slightly more detail as illustrations of variety.

Scenario study	**Scenarios in brief**
MWRAS	**Baseline** – conditions existing in year 2000

	China Dams – including all proposed Chinese dams **Low development** – based on population and water demand growth to 2020 with dams in Lao PDR and China **Embankments** – as for low development scenario but including 130,000 ha isolated from Cambodian floodplain **Agriculture** including substantial growth in water use for irrigation with dams in lower basins, and inter-basin transfers, and hydropower similar to low development **High Development** – similar to agriculture but including substantially more hydropower growth, including many proposed dams in Laos, Vietnam and Cambodia	
UPLAND	**Rural first** – multi-function landscape with relatively modest intensification (unified, localized) **Food bowl** – substantial expansion and intensification of agriculture (unified, globalized) **Glocalization** – multi-function landscape with agroforestry and use of biodiversity in conservation areas (diversified, localized) **Services Park** – conservation in large parks separated from areas of intensive agriculture and urban areas (diversified, globalized)	
OPTIM	Basin optimization Parity in water allocation	Inter-basin transfer Upstream hydropower development
WUP	Baseline Climate change Catchment change High irrigation	China dams LMB dams Flood embankments
BDP1	Baseline Upper Dams Low development	Irrigation High development
IBFM3	Baseline Flow Regime 1 (BDP1-Low)	Flow Regime 2 (BDP1-Irrigation) Flow Regime 3 (BDP1-High)
HYDRO	Baseline Upper Mekong Dam Definite Future	LMB Mainstream Dam LMB Tributary Dam LMB 20 year plan
BDP2	Baseline Upper Mekong Dam Definite Future Forseeable future situation LMB 20 year plan LMB 20 year plan without mainstream dams	LMB 20 year plan with 6 m/s (upper) LMB 20 year plan with 9 m/s Mekong delta flood management Long term future LMB long-term development LMB very high development
WUP-FIN	Economic growth Poverty reduction	Environmental sustainability Integrated-compromise
NSEC	Business as usual Green modernity	Economic colony Back to the village
CSIRO	Baseline	Future Climate
TKK	Change basin hydrology Sea-level rise	Change basin + sea-level

FISH	Baseline Intensive Basin Development	Extreme Basin Development Limited Development for Tonle Sap Watershed

Uncertainties and scale

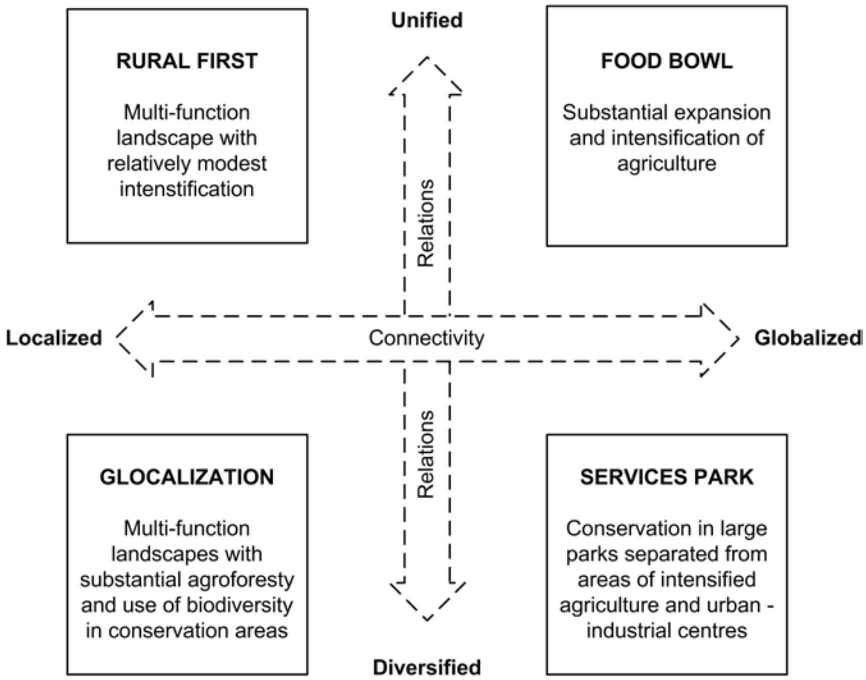
Scenario exercises that are independent of treaty procedures, while still expert-driven, have explored a wider range of approaches to construct scenarios and broader set of development and water management issues than infrastructure impacts on water flows. In this section we consider treatment of uncertainties in climate and regional development as well as issues of scale.

Scenario studies about the impacts of climate change focus their efforts on comparing projected future climate with a historical baseline. Uncertainties are handled in different ways. For example the study by CSIRO (Eastham et al. 2008) used 11 GCM models all driven with the same IPCC A1B emission scenario to create 11 variants of historical climate (1952-2002) and future climate (target year, 2030). Medians were used to characterize most likely climate and variation among models “uncertainty”. The use of multiple models by the CSIRO study is in sharp contrast to the MRC process where only the approved DSF model is used, thus essentially eliminating important sources of uncertainty from consideration. Climate projection scenarios do boundary work between researchers more interested in climate and those concerned with impacts and adaptation. They can also help with communication to a wider audience, for example, in explaining why business-as-usual strategies may not work.

Other studies use more or less models and one or more emission scenarios (IWMI and World Fish 2009: 25). In all cases the focus is on future precipitation and temperature. Other models or trend analyses are then used to assess impacts, for example, with respect to water availability, agricultural production and changing population distributions (Chinvanno et al. 2008, Eastham et al. 2008, TKK and SEA-START RC 2009). Other sources of uncertainty are not considered as part of the scenarios or immediate analyses but may be referred to in interpretation of findings as cautionary notes. For example, land-use is often assumed to remain as present apart from specific assumptions about water withdrawals for irrigation.

More holistic scenario exercises need ways to identify and systematically explore major uncertainties. One simple way sets of scenarios are constructed is to focus on a small number of key uncertainties and take extreme combinations of sets of assumptions about these uncertainties (Figure 1). In a study about upper tributary watersheds, scenarios were constructed at the wider regional level based on different combinations of uncertainties in market (horizontal axis) and sectoral (vertical axis) development (Lebel 2006). The Food Bowl scenario, for example, is strongly export agri-business oriented. Under this regional scenario the expansion and intensification of agriculture in lowland and wider valleys means much greater pressure on water resources and thus controls on water and land uses in upstream upper tributary watershed areas (Lebel 2006). Developing more elaborate storylines with explicit time sequences, key drivers and triggering events requires making assumptions explicit. Here opportunities for storylines to do boundary work among disciplines and among participants with different perspectives and beliefs is high – allowing constructive interaction to continue even when understandings are not exactly the same, preferences differ, and fits between complex pieces of evidence is imperfect but improving.

Figure 1. Four scenarios of regional uncertainties (Source: Lebel 2006).



What should be now clear is that insights do not only come from the articulation of individual story-lines, but also the contrasts between scenarios and the overall space of possibilities which they span. Comparisons among scenarios are more likely to be interesting if each is plausible and some participants think it is likely. If each scenario has some positive and negative elements for most stakeholders than the kinds of discussion encouraged can move away from the “picking winners” type to exploring alternative assumptions and understandings. In some situation the scenarios may be designed to evolve towards divergent preferences, for example, following common policy narratives.

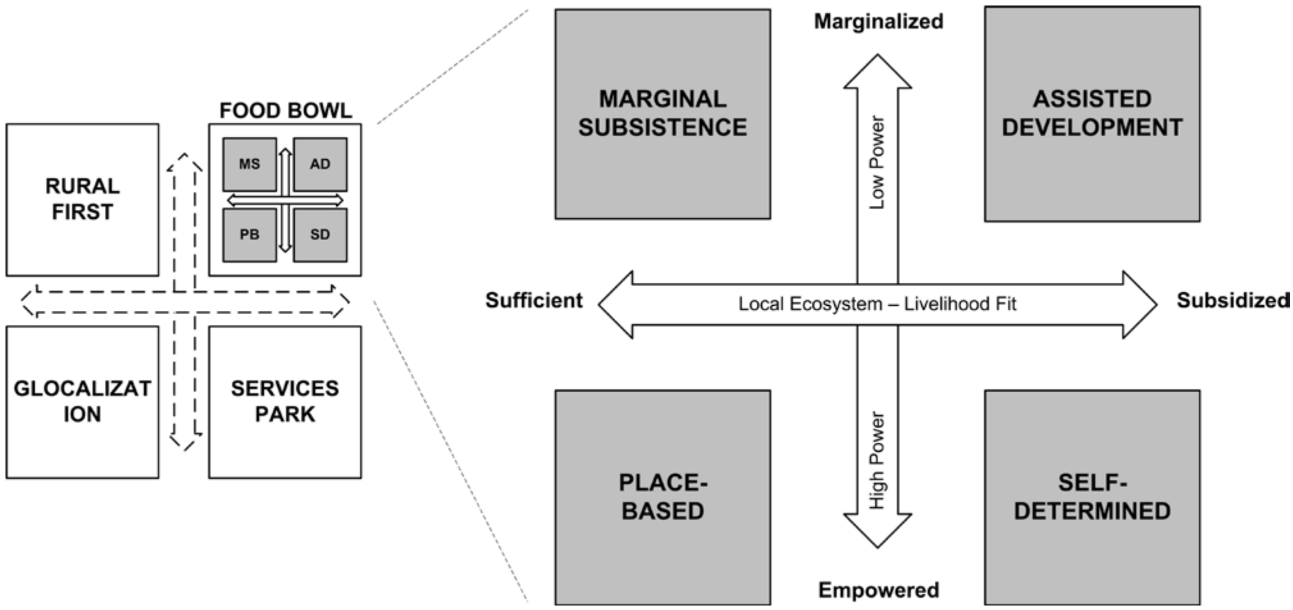
Scale issues are often subsumed under assumptions about external conditions. The MRC has put a strong emphasis on trans-boundary impacts in its scenario analyses. A mechanism for including smaller projects as part of sets of infrastructure has been proposed for BDP2groups. This limits consideration of multiple and more local effects.

The scenario study of impacts of built-structure on fisheries analysis explicitly dealt with impacts from interventions at three geographical scales – the Mekong Basin, Tonle Sap Watershed and Tonle Sap Floodplains – on the hydrology, ecology and fisheries of Tonle Sap Lake (Baran et al. 2007). Although the four scenarios were not nested (FISH, Table 1) the first three include assumptions about development at the basin scale while a fourth focused on changes within the Tonle Sap watershed.

One way to handle scale issues is to explicitly build scenarios at more than one level and analyse them jointly (Zurek and Henrichs 2007). The Millennium Ecosystem Assessment (MA) was explicitly a multi-scale with sub-global regional assessments sometimes contrasting their own local scenarios with the over-arching set of global scenarios (Millennium Ecosystem Assessment 2005, Lebel et al. 2006). Lebel (2006) nested scenarios at two spatial levels to explore key uncertainties that would impact livelihoods and landscapes in upper tributary watersheds of montane mainland Southeast Asia. The two scenarios are summarized in Figure 2. At the regional level the scenarios highlight the implications of different forms of market and political integration. At the upper tributary level the scenarios highlight changing dependencies on local natural resources and the extent of empowerment of local stakeholders in their management.

The explicit consideration of scale in scenarios opens up more possibilities for level-dependent interests and uses of water to be explicitly considered. In the Mekong region this is vital as otherwise myriad of local interests are over-looked in low resolution, large scale, assessment processes (Lebel et al. 2005).

Figure 2. Multi-level scenarios for analysis of alternative futures of upper tributary watersheds in mainland Southeast Asia Upland scenarios. Four scenarios (boxes) are shown arranged against different combinations of uncertainties at the upper tributary level related to local empowerment (vertical) and resource base of livelihood systems (horizontal). These in turn are nested within each of the regional scenarios shown in Figure 1 (Modified after: Lebel 2006).

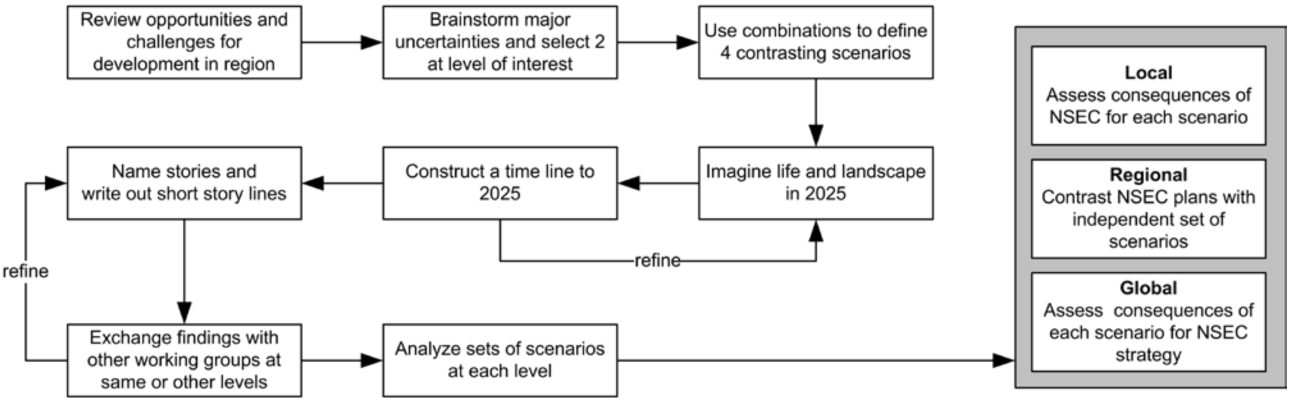


Building scenarios together

In a few instances scenarios are constructed together with a wider group of stakeholders. Building scenarios together serves two functions (Lebel et al. 2006, Lebel and Bennett 2008). First it can help stakeholders get a better understanding of what each, in the longer term, thinks is desirable or not. Second because scenarios are plausible stories about the future they require articulation and discussion about people's beliefs about cause-and-effect in development.   A better, mutual, understanding of assumptions that stakeholder have about water resources, climate change, technology, international relations and many other factors that shape development can help guide additional assessment where uncertainties are large and capacity building where key technical information is simply not understood or understandable.

In October 2006 USER and M-POWER hosted a workshop in Chiang Mai, Thailand, to specifically follow-up discussions at the Mekong Water Futures Dialogue (IUCN et al. 2007a) on the ADB-facilitated North-South Economic Corridor (Foran and Lebel 2007). At the event participants explored development assumptions by building scenarios at local, regional and global scales (Figure 3). A substantial effort was put into training neutral facilitators to guide a process in which all participants were given opportunities for meaningful input and encouraged to explain their reasoning and explore differences in views. Participation in scenario-building exercises may help understanding because it encourages critical examination of assumptions held by others.

Figure 3. The scenario-building process used to engage participants in a dialogue to explore the Asian Development Bank's North-South Economic Corridor plans and reasoning (After: Foran and Lebel 2007).



In the MRC process, consultation with other member states, and in some cases approval of specific elements by the Joint Committee, is seen in some ways as "participation". Clearly this is a much lighter and narrower notion of "engagement" in construction of scenarios than explored by some other exercises, and what is needed. Nevertheless, from the Secretariat's perspective, scenarios are boundary objects that help them deal with other Commission bodies, like the Joint Committee and Council.

Building scenarios together can help improve legitimacy of an analysis. This is one of the key reasons why participation and deliberation can be valuable. Legitimacy comes from both who gets involved and the quality of reasoning and debate. Wider participation in scenario-building itself, however, is not yet a common practice in the Mekong Region.

Exploration

Once constructed, scenarios can be used in several ways. One of the key functions of boundary objects is to improve communication. Scenarios have been used for both supporting dialogue as well as more one-way marketing of desired projects and futures. Another is to take the scenarios as input into further analyses, for example, as part of an assessment of environmental or social impacts. The distinction between "the scenario" and "its analysis" is not always sharp.

Communication and deliberation

Scenarios are sometimes made primarily as a tool to communicate ideas. In this mode the boundary object has translation or mediation functions. How scenarios are received may not match the intentions of those communicating. The outcome may be acceptance, refinement or rejection.

In June 2006 the Asian Development Bank released a working paper co-authored with the World Bank on an assistance strategy for water resources development in the Mekong Region (World Bank and Asian Development Bank 2006). The report aggressively re-confirmed the World Bank's (2004) initial analysis which drew on the hydrological models in the MRC's Decision Support Framework:

> "*The bottom line message of this Mekong Water Resources Assistance Strategy is that the analytical work on development scenarios has, for the first time, provided evidence that there remains considerable potential for development of the Mekong water resources. The Mekong basin has flexibility and tolerance, which suggests that sustainable, integrated management and development can lead to wide-spread benefits. This may*

> *contrast with the more precautionary approach of the past decade that tended to avoid any risk associated with development, at the expense of stifling investments*."(World Bank and Asian Development Bank 2006: 4)

Critiques of the ADB and World Bank's Mekong Water Resources Assistance Strategy followed. The absence of important ecological details from the models or assessment reduced the credibility of the findings. Other research in the region, including work done with and at the Mekong River Commission Secretariat, for example, has highlighted the importance of sediments, nutrient transport and even modest changes in flood pulse behaviour for ecosystem dynamics (Lamberts 2006, Kummu et al. 2008, MRC and WUP-FIN 2008). Others were concerned with process of consultation. There is need, for example, to make available all relevant documents (especially in regional languages) sufficiently in advance of consultations. Some actors, like the International Rivers Network, had criticized the MWRAS as just a tool to create investments (IRN 2006). Others have pointed out to the limited civil society engagement and incorporation of inputs in the lead-up process (Cuomo and Frewer 2007).

In Vientiane, Lao PDR, in July 2006 the World Conservation Union (IUCN), the Thailand Environment Institute (TEI), the International Water Management Institute (IWMI) and the Mekong Program on Water Environment and Resilience (M-POWER) convened the "*Mekong Region Waters Dialogue: exploring water futures together*" (IUCN et al. 2007a, 2007b). The regional multi-stakeholder platform was meant as a contribution to "*improving water governance in the Mekong Region*". A key part of the meeting was to evaluate the Mekong Water Resources Assistance Strategy. The Banks had gone through their own consultation process but with little civil society participation. The need for greater transparency and stakeholder participation was a key message from the event. Another was a better understanding of the limitations of models (Adamson 2007) and the framings that scenarios had created eliminating consideration of alternative types of development. The dialogue event was followed up by exchange of correspondence between conveners and these agencies (IUCN et al. 2007a).

Follow-up meetings included a participatory scenario building exercise focussed on exploring the Asian Development Banks' plans for the north-south economic corridor (Foran and Lebel 2007). The scenario-building event offered a different way to exploring uncertainties and alternative visions of development. Apart from deliberation about assumptions and beliefs inherent in constructing scenarios together there were also sessions designed specifically for explaining and exploring scenarios with members of other groups (Figure 3). Presenting preliminary scenario analyses to others working at same or different level helped some groups further refine their own scenario sets (Foran and Lebel 2007). In this condensed exercise scenarios played an important direct boundary functions among participants from different countries and backgrounds.

In the early history of international cooperation on the Mekong a key and early notion was that scenarios were options among which the member states had to ultimately agree upon. The 1987 revision of the earlier 1970 Indicative Basin Plan was prepared by consultants and staff of the Mekong Committee secretariat and published as "Perspectives for Mekong Development" (Le-Huu et al. 2003). Short and longer-term development scenarios were supposed to be developed and a single one elaborated as the development plan. The consultants at the time said given the political context "*establishment of a rigid blueprint for the basin's development [was] an exercise with little practical meaning*" (Le-Huu et al. 2003: 40).

Scenario planning in BDP2 appears to be returning to this earlier logic of "identifying the appropriate scenario" (MRCS 2008) as opposed to broader notions of exploring the space for development as espoused in the early World Bank (2004) study. BDP2 experts recognize that the actual choice is one for the member states and Joint Committee but expect iteratively refined scenarios to be useful in negotiations. The boundary work of the scenario, if it unfolds as the BDP anticipates, would continue to help stabilize the policy and research agenda.

In more recent years the MRC has increasingly held consultations on its analyses and plans including development scenarios. At the regional multi-stakeholder consultation on MRC's hydropower programme held in September 2008 in Vientiane, results of modeled flow changes from various water resources development scenarios were presented by the MRC (2008a). The six scenarios discussed in terms of hydropower assumptions (HYDRO, Table 2). According to the presenter the scenarios and indicators were discussed by National Mekong Committees, line agencies and other regional organizations. The presenter also noted that "*results will be discussed in various forums*". In an interesting use of framing rhetoric the last three are treated as "Future Plans" in contrast to the "Definite Future" which includes both existing and yet to be built but "on-going" projects.

At the first stakeholder consultation on BDP2 held in Vientiane, 12-13 March 2008, participants argued that "*the analyzed results of scenarios should be open for peer review*" and "*include public stakeholder consultation process before decision-making takes place*". The exact steps in how the scenarios would be used in relation to Joint Committee, Council and stakeholder consultations was debated in meetings of the Regional Technical Working Group and process adjusted again. In short which boundaries a scenario object is supposed to help manage is subject to contestation with different actors pushing and pulling to be included or exclude others.

In July 2008 as part of M-POWER I helped host and organize a workshop for staff in the BDP team of the MRC Secretariat and other experts to review draft working papers on development scenarios and IWRM strategy. Comparing what was being done by the MRC with what is possible with scenario planning methods I made several critiques. The lack of supporting storylines for modelling work, for instance, makes it hard to gauge plausibility of sequence of events, to explore assumptions and alternatives, and consider responses of people affected by infrastructure development. The scenarios, in short, are not plausible stories of the future, but little more than alternative model runs. Another limiting feature is the lack of attention given to uncertainties, exactly the type of analysis for which scenario planning is most suited. Key assumptions are buried within the DSF and not open for full scrutiny. Risks and surprises have been reduced and eliminated rather than expanded and explored; as a consequence, very little can be said about the robustness or resilience of the 'development scenarios' as strategies for regional development. Some of these limitations can be understood as arising from too strong a focus on quantification of the mainstream hydrograph and insufficient engagement with multiple stakeholders whose interests in water-related resource development and management go well beyond these narrow considerations. These in turn are explainable in part by the political context in which scenarios are seen by key actors as boundary objects to negotiations among member states.

Assessing impacts

Among several findings presented at the hydropower program consultation (HYDRO, Table 2) it was noted that average dry season flows would increase by 30-50% in northern parts of Thailand and Laos (MRC 2008a). Impacts on the flood pulse in downstream part of LMB, including flow reversals for Tonle Sap, were argued to be small fraction of historical year-to-year variability. It was asserted that LMB Mainstream dam scenario would have no additional impacts because these projects would be run-of-river. The conclusions drawn by the presenter at that event using scenario analysis were particularly positive about low impacts of LMB developments "*the flow changes caused by possible water* *resource developments in the LMB will result in small mostly positive changes in salinity intrusion in the Vietnam Delta and relatively small changes in flooding patterns around the Tonle Sap compared to the natural year-to-year variability. The LMB mainstream dams would not cause flow changes beyond a daily timeframe*" (MRC 2008a).

Hydrological models are the foundations of the MRC DSF but not always the most appropriate tools for specific applications. The MRC/IBFM program using DSF predicted changes in water levels in lower basin of 0.15m whereas other studies using have suggested effects as high as 0.30m and 0.60m. The scheme used to assess hydropower dam impacts in the DSF is a simple add-on to software originally adapted from the Murray Darling Basin; it has been criticized as less than ideal for this application and should be improved (Adamson 2007, MRC and WUP-FIN 2008).

There are other problems related to transparency as well. Scenarios cannot work as boundary objects for communication if they are opaque. Some important work using models to assess impacts of flows has been done but not shared. The results of a scenario study for MRC's BDP by Beecham and Cross were not released. Work in the IBFM program assessed impacts of a "high development" scenario but IBFM Report 8 was not released for public distribution and discussion (MRC and WUP-FIN 2008).

Despite these concerns and criticisms the MRC continues to work closely with the model-supplier and infrastructure cum engineering consulting firm Halcrow, especially within the IKMP process. Competition for contracts among different consulting and research groups is to be expected and normal, but underlines the need for high level of transparency in modeling activities or risk loss of credibility. The final report from the WUP-FIN project noted that "*the MRC would benefit greatly from continuing validation and scientific review of the model system, which is necessary for its transparency and credibility, not least in trans-boundary context"* (MRC and WUP-FIN 2008: p18).

More independent development and application of basin wide models is needed to study impacts of new infrastructure, climate and other variables. Progress would ensue from model inter-comparison exercises, using standardized inputs and scenarios. Models like VIC and VMod would be examples of suitable instruments to compare against current components in the current DSF.

The narrow hydrological focus of the "development" scenarios convened by the MRC illustrates how scenarios as boundary objects can also be used to narrow debate. Hydropower is justified by reference to low impact on hydrograph of "development" according to their own hydrological models. Scientific studies (often in collaboration with MRC itself) suggest much more care about drawing inferences about ecosystem impacts (Kummu and Sarkkula 2008, Friend and Blake 2009). A study using largely the same development scenarios of the MRC draws attention to possible adverse impacts of structures on fisheries in the Tonle Sap Lake (Baran et al. 2007). Dry season flows are particularly important in these contexts because they affect fish migration patterns and habitats and consequently fisheries productivity across the entire Mekong basin.

Ecosystem and social impacts

The MRC's use of scenarios in IBFM work under the BDP focuses on effects on flows. The initial World Bank (2004) study acknowledged that the output of the models "*is quite narrowly hydrological*". For some structures in some locations this may not be the most important impact. Consideration is also needed for impacts on sediment transport, local impacts in specific sub-basins near structures, and ecosystems. Different kinds of impacts have very different levels of difficulty associated with them. Estimating impacts on changing water levels and water quality as in sediment capture is relatively straightforward, whereas estimating effects on ecosystem productivity and interaction among structures, or cumulative impacts, much harder to estimate.

Scenarios could benefit from more explicit consideration of ecological impacts and their uncertainties. Scenarios and mathematical models can be used together to simulate and interpret biophysical or social processes and interactions that would otherwise be hard to describe and thus explore. The level of quantitative detail required in technical simulation and analysis of hydrological, ecological and social processes depends very much on the purpose for which scenario are being built and technical plausibility and capacities. The many different models made of the Mekong basin or parts, like the delta, were built to serve different purposes (Sarkkula et al. 2007).

The WUP-FIN project developed a number of models that could more explicitly examine ecosystem processes, especially in the Tonle Sap Lake, river and floodplain. The models allow exploration of different scenarios of, for example, tributary inflows, flow speed and direction, flooding characteristics, dissolved oxygen concentrations, sedimentation, larvae and juvenile fish drift (Sarkkula et al. 2004, Kummu et al. 2006, Sarkkula et al. 2007, Kummu et al. 2008). Kummu et al. (2005), for instance, used the DSF scenarios to drive hydrodynamic and water quality model they had developed for Tonle Sap Lake. In an initial study they compared the baseline to high development scenario and found significant impacts on floods and water quality characteristics in Tonle Sap Lake and floodplain (Kummu et al. 2005).

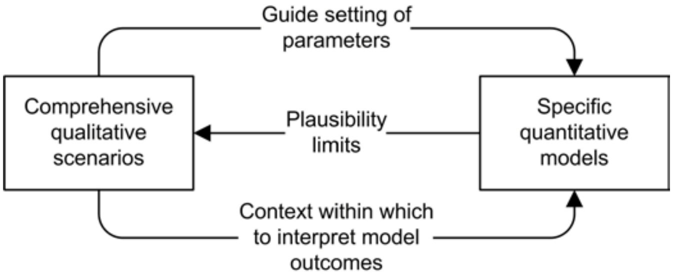
Costa-Cabral and colleagues (2007a) used the Variable Infiltration Capacity (VIC) model to study interactions between soil land-use and -cover, soil moisture, and precipitation and how they affect run-off at large spatial scales in the Mekong River basin. They found that spatial variation in soil moisture of deeper soil layers, a variable strongly affected by presence of deep roots as in forests, results in various delays in run-off relative to patterns of precipitation. Another important finding was that irrigation works in various part of the basin such as the Korat Plateau and Mekong Delta or around Tonle Sap Lake, by storing water in ponds increase re-infiltration and evapo-transpiration with the result that net run-off is further reduced. As expected, snow melt is important for base flows in the dry season of the Mekong River (Costa-Cabral et al. 2007a). In a follow-up study the researchers explored several scenarios to study impacts of changes in land-use and –cover and climate on run-off generation (Costa-Cabral et al. 2007b).

The work of Costa-Cabral and colleagues (2007b) underlines the importance of considering all major factors affecting flows together. Changes in climate, land use and regulation of streamflow by dams interact with each other in complex ways. In their study they combined the VIC hydrologic model with another model of reservoir operations to explore effects of dams. Scenarios for climate came from general circulation model outputs whereas those for land-use from historical remote sensing studies.

In both the VIC and WUP-FIN modelling applications scenarios were implemented as set of parameter settings in a complex model which was then run to simulate a set of variables of interest. The scenarios are very modestly developed: no broader vision about how such parameter settings could come about and with what sequence over time is provided. One consequence of this common approach is that there is no larger, coherent world, in which to interpret modeling finds, as would be the case if such investigations were combined with qualitative story lines (Figure 4).

Many of the sub-global and global activities in the Millennium Ecosystem Assessment, for example, tried to explicitly incorporate ecological processes into scenarios (Bennett et al. 2003). Ecosystems were not just impacted by changes in economic and social development, but changes in them could also feedback on development process, for example, through changes in provision of goods and services (Millennium Ecosystem Assessment 2005, Lebel et al. 2006).

Figure 4. Ideal iterations between scenarios and models.



The limitations of current scenario exercises concerned with water allocation and impacts of alternative water resources developments with respect to social processes is even greater than for ecological ones. At its simplest level there is the notion of linear analysis in which outputs from hydrological and ecological studies are carried over into social impacts at aggregate levels. One example is Ringler (2001) who used a coupled, aggregated, economic-hydrological model to study water allocation and use under alternative policy scenarios. She considered five main water uses: irrigation, hydropower generation, urban-industrial water uses, fisheries, and wetlands. Trade-offs and complementarities between sectors and countries were explored. The Resource Allocation Model developed by BDP1 has some similar features. At this very broad-brush level impacts on livelihoods are hard to assess in much detail. More detailed models still need to be developed. In more sophisticated versions the over-arching scenarios which guide the modeling work should themselves incorporate contrasting but coherent set of assumptions about key social and institutional factors in development (see Figure 4). In the 2006-2010 strategic plan the MRC claimed it "can develop a wide range of scenarios, extending the analysis from analyzing the initial hydrological implications to addressing the full economic, social and environmental impact (MRC 2006b: pg 16).

Influence

The influence of scenarios is difficult to assess with precision (Hulme and Dessai 2008). Most scenario building activities are poorly documented making it hard to assess learning unless the analyst was closely involved in the process. Scenario products are typically part of a wider assessment process and just one element of a wider set of factors supporting (or resisting) policy change making it challenging to attribute impact. Nevertheless a few tentative observations can be made from some of the studies discussed.

Building scenarios together provides the best opportunities for learning. Initial involvement in construction provides real opportunities to discuss assumptions and differences in beliefs (NSEC, Table 2). Here scenarios can perform many of the desired boundary functions simultaneously – helping communication and translation of ideas and understanding among disparate groups of people who although they work together may still have different interests, expectations and hopes for the future.

Where such close interaction is not feasible allowing wider input into "scenarios" that are treated as drafts to be refined is another approach. Channels for meaningful input and iteration, in short, may also foster learning between scenario developers and wider group of stakeholders. Where the organizational interests of the conveners in some outcomes are high, independent facilitation may improve the quality of consultation feedback. Otherwise actors may rightly perceive consultations as a marketing exercise and reject a process and thus product as lacking legitimacy.

The history of MRC scenario sets suggests a tendency towards gaining broader public acceptance of expert-driven scenario products. The feedback from consultations, however, has not fundamentally altered the scope, types of scenarios being explored or the hydrological flow focus (Table 2). The constraints on “learning” include some which arise from control of the research and policy agendas by member states.

In the Mekong region scenarios are still a “modest” part of the ‘discursive landscape’. Most scenario exercises have yet had little impact on allocation of water resources. The MRC scenario stream, however, has undoubtedly had some influence, in particular, after the World Bank analyses and launching of the Mekong Water Resources Assessment Strategy. The investment push encouraged by the multilateral banks was supported by some government actors in the region and helped justify their current strategies.

At the same time the content and way scenarios were being used was challenged by other, especially non-state actors. Scenarios here had a boundary function but not the one intended by their developers: a launching pad for wider criticisms of roles and strategies of multilateral organizations in water governance more broadly (IUCN et al. 2007a, 2007b). Scenarios exercises, like other knowledge-intensive activities, are never completely separable from politics in the Mekong where claims are highly contested and stakes for different interests are high (Käkönen and Hirsch 2009). It is exactly these tensions cutting across issues of power and knowledge which suggest that scenarios do important boundary work.

The history of construction and reaction to the MRC scenarios underlines several cautionary notes about policy impact. First, the most influential scenarios are not necessarily the ones produced by the best process. Alignment with powerful interests is crucial. Second, while good quality products matter, this is no guarantee of constructive policy impact. Scenarios products also need to be well-tailored to specific policy-making targets or their saliency will be lost. Third the perceived legitimacy of scenario exercises is critical to their fate, and state actors are no longer seen as having an automatic monopoly; legitimacy can also be achieved through deliberative channels.

Discussion

In the Mekong Region scenarios have been used as tools to assess and explore water resource allocation. Most applications have been little more than alternative model runs; a few have developed more elaborate storylines; none have successfully combined simulation modelling with qualitative storyline approaches (Table 1). Participation in scenario-building in construction has been very constrained rarely going beyond the immediate peer or client group. In short, the full potential of scenario-building exercises as boundary objects to support deliberative processes has not been realized.

Scenarios reflect the social context in which they were developed. The MRC scenarios view development through the lens of dams and diversions – the hydropower they might generate, hectares of fields which might be irrigated – and not the many other ecological and social changes that would accompany major infrastructure development. Other alternatives for achieving livelihood and well-being objectives are not considered because they don’t fit this hydrological lens. Storyline are under-developed because all that is needed to run the models are assumptions about which dams and diversions are in place and how they are operated. Scenarios as products and boundary objects record the social work that was put into them. The narrowing framing of successive sets of DSF-derived scenarios reflect this pre-occupation with transboundary impacts on flow to the exclusion of much else that matters.

Most effort to improve scenario exercises remains in technical dimensions – better input datasets, higher quality models. Much less attention has been given to storylines or the assumptions made about development, for example, which set of dams and diversions are being built, and what their ecological and social consequences will be (also cumulatively). The technical style of presentation of many current scenario products – as tables of model outputs and graphs of water levels with scenarios tagged with simple labels like "high development" – limits their legibility for exploration to a much more exclusive group in ways that a storyline would not.

Wider, more deliberative, use of scenarios in the Mekong Region could improve the accountability of major private and state actors involved in water resources development and management in several ways. First by encouraging actors to be more explicit about the key assumptions they make regarding causal connections, benefits and risks. Deliberative opportunities need to be created for this to happen, whether in discussion around a table, or through periods where reports and findings are open for scrutiny and comment. Second by strengthening the capacity of stakeholders to think strategically about the future, side-effects and unforeseen consequences are more likely to be identified. Scenario exercises force actors to explore time frames beyond typical planning horizons, and to consider alternatives beyond familiar, comfort, zones. This can help generate creative solutions.

But there are constraints. In the Mekong Region lack of appropriate data and knowledge – about different kinds of hydrological, social and ecological processes and possible impacts of stream flow regulation, land and water uses, or climate – remains an important constraint on making and using scenarios. For some issues quantification or detailed assessment may simply be impossible (Sarkkula et al. 2007). For scenarios to be helpful for some allocation problems credible models are needed. If models are not open for scrutiny and comparisons their results are harder to trust. These constraints on model-based tool development have been noted in Europe where much effort has been put into tools to support water management in large rivers under the Water Framework Directive (Petts et al. 2006, Borowski and Hare 2007).

The constraints are also political. The ease and effectiveness with which scenarios can be used as boundary objects is affected by the broader political and scientific context in which they are undertaken. In an international river basin the primacy of governments in cooperative frameworks is often taken for granted. In the MRC's work the focus has been on supporting negotiations among lower Mekong member states. It is only as a result of pressures from civil society that some expansion of the notion of participation beyond state officials has been begun to penetrate the logic of international cooperation. Opportunities for non-state actors to influence scenario development – to shape the boundary object – however remain small as the primary clients continue to constrain its evolution.

The notion of boundary objects provides a useful starting point for examining scenario processes, products and influence. As boundary objects, scenarios do a substantial amount of social work (Garb et al. 2008). They help bring different types of expertise – scientific, managerial and political – together in all stages, from initial conception through to construction and use. The ambiguity and flexibility can allow different parties to continue a conversation and negotiation without having identical understandings or objectives. Moreover, if well constructed, a set of scenarios spans a meaningful space in which a substantial range of pathways and perspectives can be captured, beyond the individual scenarios articulated in detail.

At the same time scenarios are not automatically deliberative or inclusive. Scenarios are used often by groups who want to push a particular agenda as by those who wish to see open discussion about alternatives and uncertainties. Scenarios as simplifications are useful for marketing and persuasion, not just as entry points for debate and exploration. Even where deliberative, the extent to which space is given to vulnerable and politically marginalized voices depends greatly on how they are convened and led and the channels opened for input in the process.

The circumstances under which scenarios emerge, the process by which they are constructed and used, the understandings they produce, and their influence on negotiations, decisions and actions need further evaluation. Expanding on our initial questions for this study we suggest it will be useful for future work to systematically consider scenario development from initiation through to use in terms of process, product and influence dimensions (**Table 3**). Ethnographical studies of scenario making and use are likely to be particularly helpful in understanding the social work they do and how they relate more broadly to framing, assessment and decision-making processes.

Table 3 Simple analytical framework for assessing and comparing scenario exercises used in this paper

	Process	Product	Influence
Initiation	What triggered? Who convened?	How was product framed?	What were the sources of legitimacy? What was the purpose?
Construction	How were scenarios constructed? Who participated? Which boundaries did scenarios span?	Which trends, uncertainties, and scales were considered? Which resource uses and users were considered? How were models and storylines used?	Did participants learn from each other? How was credibility and saliency sought?
Exploration	How were scenarios communicated and received? Who facilitated? Who was consulted? How was deliberation enhanced (constrained)?	What features of product enabled (limited) exploration? Did the product fit social context in which it was explored?	Did scenarios influence negotiations or decisions? Were scenarios perceived as credible and salient? What did stakeholders learn?

Conclusions

Scenario-building exercises could strengthen the quality of deliberations around water allocation problems in the Mekong Region. Scenarios could be important boundary objects through which researchers, policy-makers, water managers, users and affected people could interact to explore and generate alternative solutions. But so far, scenarios in the Mekong – with a few exceptions – have been used primarily to help experts work together on models and then communicate findings from those modelling exercises to a narrow set of clients concerned with just gross changes in flows. This is a very narrow interpretation of what scenarios are that restricts the boundary functions they could play in improving and democratising water governance in the Mekong Region.

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Deliberation, scale and the governance of water resources in the Mekong Region

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Abstract

Scale is a key feature of regional waters and its politics cuts across 'basin' boundaries. In the Mekong Region there is a recurrent demand for water resources development projects and major policies proposed by government leaders and investors to be scrutinized in public. As the size of these projects increase there is also need to consider the benefits and risks not only within, but also across, borders. Deliberative forms of engagement are potentially very helpful because they encourage supporters and critics to articulate assumptions and reasoning about the different benefits and risks associated with alternative options. Deliberative processes may compliment and inform more conventional representational and bureaucratic approaches to planning and decision-making. But they are also likely to be subject to the sort of scale politics which can confound institutionalized decision-making. Scale contests arise in dialogues and related arenas because different actors privilege particular temporal, spatial and administrative levels in their analysis, arguments and responses. This paper explores how deliberative engagement has been affected by, and responded to, the politics of scale. Five case studies from the Mekong Region are analysed. We

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find evidence that scale politics can affect who participates, the format, the content and outcomes of deliberative engagement. Conveners have sometimes responded to, and overcome, debilitating forms of scale politics, for example, by creating multiple venues, altering languages and styles of interaction, and supporting representation by otherwise silent interests, but deliberative engagement is still far from being a norm in the Mekong Region.
Keywords: water governance, politics of scale, deliberation, Mekong Region, hydropower, dialogue

Introduction

There is no single, correct, area for managing regional waters. In the Mekong Region the spaces corresponding to formal systems of representation or administrative authority over water- and land-uses typically have different boundaries and are part of separate hierarchies of responsibility and accountability (Hirsch 2001; Lebel et al. 2005; Molle 2007b; Sneddon 2002). These, in turn, rarely correspond to simple, hydrological, notions of a basin.

Inter-basin diversions and transfers, groundwater extraction, tidal barriers, and virtual water in trade, increasingly make it hard to manage water solely at the level of the basin. Key ecological processes, from the lifecycles of aquatic organisms through to major nutrient cycles and sediment transport and deposition processes are often multi-level, requiring careful consideration of both spatial and temporal scales (Sidle et al. 2006; Sneddon 2007). As a consequence the goods and services arising from flow of water and associated ecosystems are also multi-level. Moreover, different users and uses become more closely associated with different levels and scales. Scale is a key feature of regional waters and its politics cuts across 'basin' boundaries.

In the Mekong Region, local impacts, uses and management actions have been largely invisible by the ways in which key state agencies enumerate benefits, burdens and risks. When objectives in development are articulated in terms of monetary flows through governments then it is the grand, or "mega", projects which are emphasized and promoted (Bakker 1999; Molle and Floch 2008). Large dams for hydropower, massive diversion schemes for irrigation and long walls for flood protection are promised as ways to solve water management problems, secure energy and alleviate poverty. If objectives in development were to be described in terms of livelihood security of households living along the banks of the river then alternative priorities and options emerge. The importance of seasonal wetlands and fisheries are emphasized as are technologies which can be locally accessed and controlled, like small weirs, local canals and pumps.

The objectives and means of water resources management and development need to be debated. Different perspectives on developing regional waters need to be compared, for instance, with how they might affect social-ecological resilience at different levels, which social values they prioritize and the understandings upon which they are based. The proposals of national leaders and investors need to be scrutinized in public for the benefits and risks they involve both within and across borders (Dore 2007). Deliberation is an important process because it requires supporters of projects and policies to articulate their reasoning and identify which level-dependent interests they serve or risks they create.

This is both a need and a challenge in the Mekong Region. All countries share recent histories of highly centralized authorities, military rule, and remain, at best, semi-democracies. Access to information through normal channels remains uneven. International banks and private firms have often had better access to information from, and stronger accountability relationships with, national governments than a country's own citizens. In these circumstances there are expectations and hopes that various alternatives arising out of direct action by citizens, including farmers and fishers, or structured assessments, joint fact-

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finding, multi-stakeholder dialogues and other forms of deliberative engagement will lead to fairer allocation of burdens, benefits and risks. Given the significance of scale issues in water politics in the Mekong Region it is inevitable that deliberative forms of engagement will have to grapple with scale challenges. Thus, the main question addressed by this paper is: How have efforts at deliberative engagement, being affected by, and responded to the politics of scale?

Deliberative engagement

Deliberative engagement in this paper refers to structured and informed conversations in which various stakeholders "are willing to revise preferences in light of discussion, new information, and claims made by fellow participants" (Chambers 2003). A key feature is that there is time to consider different issues, evidence and arguments. Deliberation can help people learn about others' problems, interests and shared resource constraints (Dryzek 2000; Leeuwis and Pyburn 2002). It may also expand acceptance of decisions and outcomes, and thus, effectiveness of implementation efforts (Dore et al. 2004). Engagement activities may be convened by state, multilateral, private or community organizations.

Deliberative engagement can take place at different levels: local watershed groups may argue over allocation rules and validity of claims about causes of shortages; national water committees may debate priorities among basins, regions and sectors; international meetings negotiate allocation of water among states by season. Deliberations may also confront questions about the appropriate scale and levels of assessment and policy responses (Pingree 2006). Deliberative engagement, therefore, may be part of, help shape, and be subject to, politics of scale.

Politics of scale

Scale is defined as the spatial, temporal, quantitative, or analytical dimensions used to measure, or rank, and study any phenomenon (Gibson et al. 2000), and levels as the units of analysis that are located at different positions on a scale (Fig. 1). Scales of interest in water management often have, or imply, hierarchy (Lebel and Imamura 2006). Thus, choosing a scale implies constraining and often specifying a particular set of levels.

Scale, represents a class of key choices, commitments and constraints (Cox 1998; Lebel 2006; Swyngedouw 1997). Some actors are free to select their vantage or participation points, whereas others are restricted by mandates to viewing water resources and management from a particular level. Actors contest scales and levels, overtly through debates, media releases, lobbying and protests, and more subtly, through use and control of technologies, indicators, measurements and controlling the channels of contestation (Lebel et al. 2005). Thus, some actors push for hydrological scales with levels that correspond to manageable units in their models or infrastructure they operate. Others promote conventional, area-based administrative hierarchies, arguing that this is where capacity, accountability and legitimacy already exist. Differences between administrative and hydrological scales (Fig. 1), for example, are a common source of tensions in water resource governance.

Scale contests also arise in dialogues, assessments and other forms of deliberative engagement because different actors privilege particular temporal, spatial and administrative levels in their analysis, arguments and responses (Lebel 2006; Lebel et al. 2006). Conveners may take steps in selection of participants and format of events to ensure there are constructive exchanges and

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debates among levels and scales. Efforts aimed at shifting the scale of assessment, allocation or management strategy we call "rescaling" and to prioritize particular levels on a scale, "levelling". But scales and levels cannot be adjusted or shifted entirely at whim. Seasonal dynamics of flow regimes are important to fish (and thus, fishers) on different temporal levels than the operational and planning logics of hydropower generation, irrigation and flood risk management (Sneddon et al. 2002). Likewise ecological processes can be mapped to different spatial levels (Fig. 1). The spatial organization of ecosystems across landscapes at different levels can have has profound impacts on mobility of animal and plant populations, particular, for aquatic life forms restricted to rivers and wetlands (Lebel et al. 2008). Ultimately, the scales and levels in use are a joint product of biophysical and social processes; they are not unambiguously defined by the physics of flows, the dynamics of ecosystems or social institutions.

Methods

Our approach was to analyze a set of five case studies of deliberative engagements (Table 1) concerned with water resources development and management in the Mekong Region. A case typically included several events and associated documentation over a particular period. Table 1 summarizes the key features of the case studies.

For cases one and five in Table 1 all of the information we used was based on secondary sources. For cases two and three we also had the benefit of direct observations as participants in some of the meetings. For case four the authors were intimately involved as members of the convening group.

The five case studies map to different levels on two spatial scales, hydrological and administrative-territorial, but comprise similar time or planning scale (Fig. 2). Watershed or river sub-basin organizations, irrigation districts and water user groups are other venues with associated dialogue processes important for water management at finer time scales. National water committees typically make decisions on large-scale, long-term infrastructure as well as key decisions or rules on allocation and flood diversions for major national river basins that are seasonal. These later arenas are not considered further in this paper. A few of the key actors convening various processes on the longer-time frames described in the text are shown (Fig. 2).

Negotiating the 1995 Mekong Agreement

The negotiation of the 1995 Mekong "Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin" were difficult because, without the active engagement of China, the incentives to cooperate were perceived by Thailand to be less than for Laos, Cambodia or Vietnam (Radosevich 2000). Thailand, like China, had the resources and interest in making bilateral deals to meet growing water and energy needs (Dosch and Hensengerth 2005). The interventions of the United Nations Development Program (UNDP) were critical as initial manoeuvring by Thailand and Vietnam threatened to prematurely end negotiations (Browder 2000). It took a series of meetings, first agreeing on the terms and procedures, and then moving through multiple rounds of revisions of a single negotiating text (Radosevich 2000).

With an eye to the future possibilities for dams and diversions, the most difficult negotiations centred on Articles 5 and 6 (Radosevich 2000). The text finally agreed to embed a principle of reasonable and equitable utilization, subsequently also adopted in international water law. It was agreed that different rules were to apply for the Mekong mainstream than the tributaries. It was also agreed that some interventions would require only notification of all members; more substantial interventions with possible transboundary impacts require prior consultation (Ma et al. 2008). The 1995 agreement was less constraining for Thailand than the earlier ones of 1957 and 1975 as it no longer included a veto on Mekong River mainstream development by members (Browder 2000).

The final agreement represents an important rescaling of region and basin. It turned projects like the Kong-Chi-Mum inter-basin transfer scheme and the controversial Pak Mun dam (Foran 2006), which began life as internationally-driven exemplars, into just another “national” project with “local conflicts” (Sneddon and Fox 2006). By design the Mekong River Commission (MRC) is an amputated river basin organization – its tributaries pruned and headwaters lopped. The agreement’s focus on equitable utilization among states has helped render fishers, and other water users which rely on local services, less visible (Bakker 1999; Sneddon and Fox 2006).

Under the 1995 Agreement parties agreed to ensure acceptable minimum monthly flows, enable natural wet season reverse flow of the Tonle Sap and not to exacerbate floods. It was further agreed that the details – such as, defining what is “acceptable” – would need to be worked out subsequently in the formulation of a basin development plan (Article 24), and the establishment of rules for water utilization and inter-basin diversions (Article 26).

The 1995 Agreement established the MRC as the implementing agency with separate Council at the Ministerial level and a Joint Committee of senior bureaucrats (Fig. 3). Each of the countries separately established National Mekong Committees (NMCs) headed by their representatives on the Joint Committee institutionalizing some of the politics of scale apparent in deliberations. Subsequently, for example, countries like Thailand found it easy to weaken its MRC links, commitments and presence by appointing a Committee poorly connected to real decision-making and resource control within the country. The Committee has been affiliated with The Department of Water Resources in the Ministry of Natural Resources and Environment since 2002 administrative reforms but remains poorly connected to older and more powerful agencies like the Royal Irrigation Department and the Electricity Generating Authority of Thailand. These circumstances persist, in part, because NMCs were not part of original Agreement. These level and scale gaps, or lack of interaction, are both cause and consequence of scale politics.

The interests of donors and multi-lateral agencies in regionalization of water resources management were critical to the establishment of the MRC. This influence has continued with most of MRC’s budget for work activities coming from donors. The financial independence from the member countries has its merits and drawbacks. On the one hand it could mean assessment and research activities could go ahead without being easily blocked by member states withholding funding; on the other hand this also makes it easier for governments to disown and externalize MRC’s work when it is in their self-serving interests.

The negotiations which culminated in 1995 are an example of a deliberative process among governments promoted by international actors, shaped by national concerns, but cognizant of regional-level issues, that ended in agreement to cooperate. Subsequent negotiations on the specifics of planning basin development and water allocation rules have been difficult and the task set for the MRC remains unfinished.

Planning basin development

The 1995 Mekong Agreement mandated the MRC to prepare a Basin Development Plan (BDP). That process was delayed for several years, in part, because of insufficient donor funds (Browder 2000).

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The first phase of BDP process began in 2002. National governments were viewed as the primary stakeholders in MRC negotiations: governments are described as "internal" and non-state actors, "external". In the BDP process external stakeholders got involved through forums at country, basin or sub-area levels. These happened relatively late in the process, but by early 2005 a series of forums had been completed (MRC 2005). The consultations resulted in more than 400 project proposal ideas. Many were at relatively local levels, whereas the BDP's mandated focus has been on basin-wide development projects and national projects with potential transboundary impacts (MRC 2006). Among the lessons acknowledged were that there were important differences among member countries in how they perceived and incorporated public participation in planning. Deliberative norms are still far from being widely accepted with water bureaucracies continuing to privilege internal expert and politician-led assessment of options and decision-making. The MRC BDP group also thought that transboundary multi-sector dialogues were more difficult to conduct than those within a country about a single sector (MRC 2005). Sokhem and Sunada (2006) predicted that major disconnects between conversations in the MRC structures and those within countries were likely to persist and thus prevent real integration of basin-level and national-level development plans.

Initial plans for phase II of BDP strongly emphasized investment and were approved by the MRC Council in 2005, but later revised as a result of donor calls for a more balanced view of development. According to the MRC the second phase (2006-2010) "is designed to institutionalise the participatory planning process established during BDP Phase I". In March 2008 the MRC Secretariat organized a stakeholder consultation forum on BDP in Vientiane, Lao PDR (MRC 2008). Members from the water governance network M-POWER provided facilitation support and suggestions on the draft agenda to ensure adequate discussion of important topics. Several experts also participated in a follow-up workshop to review draft working papers on development scenarios and IWRM strategy. In these discussions questions frequently arose about choices of levels and scales at which indicators and model outputs should be evaluated. Diverse and broader engagement takes time, but should lead to better plans.

In any case, events are overtaking plans. On paper the MRC has a role as a convenor, but in practice it has scrupulously avoided contentious issues and disputes. It has often been absent from or silent about major bilateral or national government proposals for, and decisions on, water resources development in the basin (Jacobs 2002; Osborne 2004). In the first decade of its operation, the MRC secretariat has had little involvement in, and usually very limited information about, the hydropower development on the Mekong River mainstream in China, and on tributaries in Laos and Vietnam. Its hydropower program strategy first agreed to in 2001 only secured funding in 2006 and in September 2008 was holding its first regional multi-stakeholder consultation. The MRC was sidelined while the four countries of the upper Mekong—namely China, Burma, Laos and Thailand—agreed to implement a navigation improvement project that involved blasting of several rapids along 900km stretch of the river between Jinghong in China to Luang Prabang in Lao PDR. In the past it has also been excluded from speculations about possible Lao-Thai water transfers, and diversions from the Mekong to irrigate more of northeast Thailand (Molle and Floch 2008). It distanced itself from the environmental impact assessment process for Sesan dams and operational incidents that have affected downstream communities (Wyatt and Baird 2007).

Although it has not been able to engage when it probably should have, the secretariat of the MRC secretariat has emerged as a significant knowledge broker. The 2006-10 Strategic Plan explicitly acknowledges this role. A combination of consultants external to region and appointed researchers within the region has produced a significant body of knowledge that could inform public deliberations on many aspects of water resources development and management. Unfortunately, wider dissemination and use of data, models and other research findings has often been controlled. Out-going communications are filtered by centralised information management practices in the Secretariat (Hawkesworth et al. 2007). The MRC Secretariat argues that it is not an independent organization and is bound to respect member countries wishes, especially on sensitive information. This lack of transparency has frequently been raised by critics in dialogue (e.g. IUCN et al. 2007a) and is undermining the credibility of the organization (Hawkesworth et al. 2007). These knowledge needs to be disseminated more widely; doing so will strengthen not weaken the role of the MRC in facilitating and supporting deliberative engagements.

The core MRC program on basin development planning has largely been a technical support activity; its impact on negotiations among countries has been slight. Scale politics is part of the explanation of why deliberations have not led to significant joint planning decisions. Other actors, in particular banks and investors are meeting, in other arenas, are debating and forwarding water resource development agendas without much regard for the BDP process.

Banking on regional hydropower cooperation

To a certain extent all regions are imagined, but the Mekong 'region' is increasingly becoming an institutionalised reality for both State and non-State actors. There are several notions of 'region'. In the previous two sections we focussed on the Lower Mekong as it has been constructed for and by the MRC. In this section we explore the deliberative elements of initiatives driven by the Asian Development Bank and World Bank for a much a larger territory, the Greater Mekong Subregion which includes the countries of Cambodia, Lao PDR, Myanmar, Thailand and Vietnam as well as the territories of Yunnan Province and Guangxi Zhuang Autonomous Region of China (ADB 2007).

The Greater Mekong Subregional (GMS) economic cooperation was established in 1992 with financial support from the Asian Development Bank (ADB) to emphasise transboundary expansion of trade, investment and infrastructure among the six countries – Cambodia, China, Lao PDR, Myanmar, Thailand and Vietnam – an idea found attractive to these national governments. The profile of the ADB-GMS has grown in recent years with a series of inter-governmental summits between these Heads of State. "Regional waters" were initially left off the GMS agenda to ensure that the developing cooperation on a range of other fronts – including trade, opening borders, telecommunications, and road transport – was not destabilised. But this does not mean water resources development has not been on the Agenda of the ADB. Behind the leaders' summits are numerous Ministerial and expert group meetings and negotiations. In more recent years many of these have dealt with energy security and cooperation (Yu 2003) often providing entry points to "water resources" development issues.

An example was the release in June 2006 of a working paper co-authored with the World Bank on an assistance strategy for water resources development in the Mekong Region (World Bank and Asian Development Bank 2006). This report re-affirmed the World Bank's (2004) Mekong Water Resources Assistance Strategy which used the hydrological models in the MRC's Decision Support Framework to justify further investments in dams based on the argument that they have acceptably low impacts on hydrology at larger spatial levels. The joint paper argues for the potential for development of Mekong water resources and claims the "basin has flexibility and tolerance". It also called for abandonment of the "precautionary approach of the past decade that tended to avoid any risk associated with development, at the expense of stifling investments" (World Bank and Asian Development Bank 2006). These strategies were important topics in an independently convened dialogue (see next section) because various civil society organizations did not feel there had sufficient public input into their original formulation.

Multilateral banks have played a role in constructing a narrative of a Mekong region in which more investments in hydropower are likely. In 2005 the World Bank approved loan guarantees for the Nam Theun 2 dam in Lao PDR making it possible for financing of almost 1.6 billion USD to go ahead, the largest single investment in the country's history. Both the World Bank and Asian Development have opportunities to guide investments through conditionality on loans, technical expertise and political connections. Looking to the future the political influence and leverage of the multi-lateral banks may be on the wane as a more diverse group of commercial banks and other investors enter the Mekong Region. This will create new challenges for coordination and transparency. Ensuring responsible corporate practices in these circumstances will benefit from setting high standards and codes of practices for the private sector and monitoring to make sure these are followed.

The ADB organized three regional consultation workshops in Bangkok on the GMS Energy Strategy between July 2006 and June 2008 to discuss findings of their energy strategy study. The first workshop included senior government officials from the GMS countries and representatives from academia, civil society, development and private sector organizations (ADB 2006). At the workshop there was broad agreement that "a participatory approach would be essential in strengthening ownership among GMS countries, facilitating consensus building, and ensuring the sustainability of the regional energy strategy" (ADB 2006). Representatives from civil society groups argued the importance of assumptions and quality data as these could greatly effect outcomes of the modeling work and the need to improve transparency of energy planning processes at the national level. Another area of concern and of divergent views were on what were the realistic expectations for renewables in future energy mixes (ADB 2006). The draft strategy document (ADB 2008) tabled at the third workshop argues strongly in favor of regional integration of energy supply infrastructure from an economic perspective but gives much less attention to political and financial risks.

For more than a decade a discourse of the Mekong Region as under-developed has been used by multilateral banks to re-scale plans for how resources should be managed for a particular form of capital-intensive development through arguments about the benefits of integration, economies of scale and, at the same time, the "naturalness" of the region (Bakker 1999; Molle and Floch 2008). Conventional hydropower technology fits neatly with notions of rescaling development. Large projects need foreign investment and expertise. While size makes these projects conspicuous; technical complexity often keeps the planning and decision-making processes out of the public domain and well beyond reach of many local communities that ultimately would be directly affected by such projects (Bakker 1999). Moreover hydropower converts a water service to electricity that serves distant consumers, outside the basins and even beyond national borders where the infrastructure is located and impacts are felt. This re-scaling brings with it changes in groups of state-level or international stakeholders which must be dealt with (Hirsch 2001).

Multilateral, and increasingly other large commercial, banks through loan agreements, technical support and teams of consultants have a huge influence over large and long time frame project cycles because these require money and human resources. Multilateral banks are creating an investment region; other actors now need to mobilize to make sure those investments are adequately scrutinized.

Exploring water futures together

Public consultation by the multilateral banks has historically been very limited. Most meetings are dominated by States and their officials, international financial institutions, and the private sector. As a result several groups have launched parallel activities to query and propose alternatives. In November 2002, for example, a meeting on "Dialogue on River Basin Development and Civil Society in the Mekong Region" held in Ubon Ratchathani, Thailand, concluded with calls for much greater civil society involvement (Dore 2003). Another meeting convened by the non-governmental organization Towards Ecological Recovery and Regional Alliance with other partners in November 2004 drew similar conclusions and called for the establishment of a Mekong People's Council (Wongruang and Samabuddhi 2004). This did not happen. In other cases dialogues did not proceed as planned. A National Water Dialogue held in Lao PDR in 2005 illustrates some of the challenges: half of the knowledge inputs were banned the night before the event. Any paper that mentioned China was considered inappropriate for publication by? the National University of Laos.

In this section we focus on the activities of one network which the authors helped establish and have been closely involved in. M-POWER or the Mekong Program for Water Environment and Resilience began in 2004 as the Mekong Water Governance Network (M-POWER 2008). For M-POWER, the Mekong Region is taken to encompass the territory, ecosystems, people, economies and politics of Cambodia, Laos, Myanmar, Thailand, Vietnam, and China's Yunnan Province. M-POWER made a deliberate choice to focus on the wider region, including several international and many domestic river basins, rather than to overly focus on the Mekong River Basin and thereby frame too much 'in' or too much 'out' of different political arenas. M-POWER activities are supported by a network of about thirty partner organizations. Most members are from academic and non-governmental organization, but also belong to international organizations and government agencies. The network has funding from several sources, including Echel Eau and IFAD through the Challenge Program for Water and Food for its activities, but ultimately relies mostly on the diverse voluntary contributions of its partners.

In November 2004 the Water and Nature Initiative of the World Conservation Union (IUCN) convened a high-level roundtable on "Using Water, Caring for Environment: Challenges for the Mekong Region" at the 2004 World Conservation Congress in Bangkok. The M-POWER network provided some facilitation support and speakers. The event included Ministers from five Mekong countries (all but Myanmar) as well as non-governmental actors. Some sensitive issues, like inter-basin diversions, Nu-Salween infrastructure and threats to Great Lake - Tonle Sap ecosystem were discussed. For our analysis here we consider the "Mekong Region Waters Dialogue".

In July 2006, IUCN with other partners including the Thailand Environment Institute (TEI), the International Water Management Institute (IWMI) and M-POWER, hosted the "Mekong Region Waters Dialogue: exploring water futures together". The event, held in Vientiane, covered governance issues in several sectors and at several levels (IUCN et al. 2007a; IUCN et al. 2007b). The dialogue was intended to be "a regional multi-stakeholder platform organized to provide an opportunity for high-quality, multi-faceted debate and learning that will contribute to improving water governance in the Mekong Region". One part of the meeting and report specifically asked participants to evaluate the role and governance performance of the World Bank, Asian Development Bank and Mekong River Commission. Other parts reviewed their strategic plans for the region providing commentaries and suggestions.

The multiple and changing roles of MRC and its secretariat, for example, were hotly debated. Some stakeholders would like to see it involved more in investment facilitation, others in regulation, and yet others more as a knowledge broker or convener of dialogue-like activities. As described in the earlier case studies the MRC has had some difficulties with each of these roles individually. It has struggled to take information it has in hand or needs about ecological processes at multiple levels into planning. It has also struggled with simultaneously considering water-related services derived from the basin and used at different levels and scales. Overall the deliberative engagement stressed the need for greater transparency and stakeholder participation, consistent with some of the promises in the draft 2006-10 Strategic Plan (IUCN et al. 2007a).

The critique of the ADB and World Bank's Mekong Water Resources Assistance Strategy covered many areas, including issues of process, like the need to make available all relevant documents sufficiently in advance of consultations, preferably with local language summaries, so they can be properly reflected on during dialogue activities (IUCN et al. 2007a). The discussions also questioned some of the key assumptions about development needs and river basin management capacities. Although there was no consensus reached in these debates, they were important in helping different stakeholders learn about the limitations of their own understanding and analyses as well as the sometimes very different perspectives of other stakeholders.

The dialogue event was followed up by exchange of correspondence between conveners and these agencies which were included in the final report (IUCN et al. 2007a). The Dialogue event may have contributed to the way the Word Bank and Asian Development subsequently downplayed their Mekong Water Resources Assistance Strategy and also helped trigger greater interest in multi-stakeholder processes.

A set of follow-up national level and language dialogues then took place in Lao PDR and Cambodia. The activities in Cambodia, for example, were organized through the Cambodian Water Working Group which represents more than 30 non-governmental, international and other organizations. The working group is facilitated by the Cambodian Center for Study and Development in Agriculture (CEDAC) - CEDAC was also one of the founding members of M-POWER - and places a strong emphasis on irrigation and its interaction with other water uses and users. Between November 2005 and February 2007 the working group held 12 meetings and two study tours.

A two-day dialogue event was also held in October 2006 in Chiang Mai, Thailand, to specifically follow-up discussions at the Vientiane event on the ADB-facilitated North-South Economic Corridor (Foran and Lebel 2007). This meeting was notable for its diverse participation, including representatives from Myanmar as well as the ADB. The event focused on exploring development assumptions through building scenarios at local, regional and global scales.

Networks and organizations with flexible and diverse links with governments, firms and civil society are in a good position to convene and facilitate dialogues on sensitive but important topics for development in the Mekong Region. The outcomes of these are not primarily in terms of decisions on projects, policies or institutional reform (Table 1) but rather in making sure alternatives are assessed, rights, risks and responsibilities acknowledged and mutual understanding improved (Dore 2007). On the other hand such processes may lack the coherence and continuity which well-funded and institutionalized relationships bring with them. Thus, by mid-2008 the Water Futures Dialogue process appeared to be splitting into several relatively independent threads. IUCN and M-POWER, for example, were planning to convene and follow-up different parts of the agenda, while other actors like the MRC and ADB may be increasingly taking on convening roles for consultation-style events. At more local levels within countries parallel experiments are underway, in particular, with river basin organizations of various sorts and at different levels, often premised on notions that they would support engagement with various stakeholders within and beyond government (Molle 2007a; Thomas 2005).

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Managing fisheries in Tonle Sap – Great Lake

The fisheries of the Tonle Sap - Great Lake (TS-GL) ecosystem are crucial to the diet and livelihoods of the population of Cambodia (Kummu et al. 2008; Kummu et al. 2006; Sokhem and Sunada 2006). More than 60% of the floodwater of the TS-GL comes from the Mekong River, the remainder from the catchment areas of the lake. At full flood the TS-GL temporarily stores about 15% of the average annual discharge of the Mekong River (MRC et al. 1998). While estimates vary, one finding puts the present annual fish catch from TS-GL at 235,000 tonnes depending on the season (van Zalinge et al. 2001), an indication of the Lake ecosystem's extraordinary productivity (Lamberts 2006).

The Tonle Sap Basin Organization was set up with funding from ADB as a dialogue forum among line agencies and local government under the Cambodian National Mekong Committee (Wright et al. 2004). Olivier Serrat (2004), a senior economist with the ADB said at a meeting on their Tonle Sap Basin Strategy in Phnom Penh in March 2004 that " natural resources do not recognize administrative boundaries and decisions in one part of a basin can have significant impacts on natural resources elsewhere… it stands to reason that the Tonle Sap basin's natural resources would be best managed through the mechanism of long-term plans developed collaboratively by local, provincial and national stakeholders". But practice has unfolded differently. The extent of opportunities for public participation in its operations and future planning roles appear modest with representation on committees by "selected" NGOs. The original plan called for sub-basin institutions (Milner 2005), but these do not seem to have been linked or created. From the outset limited financial resources, technical skills and inadequate representation of a diversity of stakeholder interests have constrained the effectiveness of the basin organization (Sokhem and Sunada 2006). Although the Tonle Sap Basin Management Organization was set up under the Cambodian National Mekong Committee it is not well connected or supported by other key agencies in the Government of Cambodia nor by the MRC and the NMC? (Sokhem and Sunada 2006).

The lake looms large in national politics in Cambodia by its sheer size and importance as food and income sources, but when development discussions are scaled up to regional development these values are often downplayed in assessing other metrics – like counting potential mega-watts of hydropower electricity generation and more recently the size of oil reserves.

Scientific assessments give grounds for concern about the local social and environmental impacts of upstream dams and diversions on natural flood regimes and sediment transport (MRC and WUP-FIN 2007). Looking up a level, attempts to manage the lake area without reference to planned interventions elsewhere in the Mekong River Basin make no sense. Looking down a level there has been no effort to integrate the organization's basin-wide management actions with pre-existing local arrangements (Middleton and Tola 2008). In Sokhem and Sunada's (2006) view the proliferation of institutions, within Cambodia and internationally, are a barrier to problem solving because of fragmentation and compartmentalization of responsibilities.

The donor-driven Tonle Sap Basin Management Organization appears to have been completely bypassed, and maybe also replaced, with the creation by the Government of Cambodia of a new entity in October 2007, the Tonle Sap Basin Authority (Royal Government of Cambodia 2007). The Royal Decree which established the authority was prepared quickly and without broad public consultation (Middleton and Tola 2008). The thirty or so members of the new Authority come largely from various central ministries and Provincial Governors. The Cambodian National Mekong Committee has one member. No positions are available for fishers or farmers or civil society organizations. Some press articles have claimed that primary motivation was to coordinate the exploration of oil (Associated Press 2007).

In the Mekong Region integrated water resources management at the basin level through creation of river basin organizations has again and again proven much more difficult in practice than plans and promises would suggest (Biswas 2005; Molle 2008). Linking institutions at different levels has been hard, in part, because none of the individual levels are secure or functional. The Tonle Sap case study again underlines that claims about stakeholder participation and dialogue in basin initiatives need to be treated with substantial skepticism. Very often what is meant in the Mekong Region is participation of different central government agencies and more local government structures (e.g. provincial) and integration means little more than trying to achieve some modest degree of coordination.

Scale and deliberation

Ecological processes, actors, and social institutions relevant to governance of water resources in the Mekong Region map to different levels on multiple scales (Fig. 2). This creates tensions and opportunities in which scale issues come to the fore in political contests. Efforts in deliberative engagement have been affected by, and responded to, politics of scale in a several ways. In the following sections we group these into four: who convenes and participates, format and venues, content and lastly, outcomes.

Who convenes and participates

Scale politics defines and limits who participates and with what roles in deliberations. The Mekong Agreement negotiations were driven by tensions between international agencies and a few donor countries interested in regionalizing development, and rather disparate state interests. One consequence was the exclusion of the upper basin countries, China and Myanmar, neither of which had much to gain from joining and potentially more to lose. Another was a rather narrow focus on state-level interests. At one level lower, the Tonle Sap case study documented similar winnowing processes at work determining who participates. Deliberation here took place largely among central and provincial state agencies. There was little opportunity to deal with important transboundary issues related to international developments in the basin or to engage with local-level institutions already in place within the basin. These two example show how deliberation at, and about, some levels may be hindered by scale politics.

The BDP process inherited many constraints from the initial Mekong Agreement, especially, the emphasis on state level interests and trans-boundary impacts within the lower basin. Nevertheless, the MRC responded to criticisms about the lack of wider engagement with stakeholder consultation meetings in latter half of phase I and phase II. This created opportunities for information about ecological processes important to more local-level livelihood interests to be tabled. This is an example of levelling as it drew attention to different levels at which water resources and related services are used and managed. It is still too early to see if these decisions by conveners will have any long-term influence. Nor is it certain that these conversations will have much influence on national planning or practices.

In the Mekong Region governments are still seen by many as the actor that needs to be convinced or changed to solve water governance problems in the region at all levels, from international through to local. But research and practices suggest a much more complex mix of actors are involved in water governance (Lebel et al. 2007). Moreover, the array of firms and banks, and to a lesser extent, local water user groups, environmental and social development advocates are not without strategies and skills in deploying various institutions of the state at the levels they work best at.

Who convenes particular events or process matters a great deal for its legitimacy and credibility and who attends and how they participate. Perceived neutrality with respect to countries (but not perhaps towards notions of regionalization) in negotiation was an important feature of the UNDP's role in the discussions which led to the Mekong Agreement. In the other cases conveners were clearly not neutral, but they did, with varying degrees of competence and success, attempt to lay-down procedures and include stakeholders they felt were needed. Getting all relevant stakeholders to participate is a major task for conveners. It requires good communication and follow-up. In the BDP Phase II stakeholder consultation, for example, there were no representatives from Upper Mekong countries and only a few invited civil society groups chose to attend.

Multi-stakeholder engagement requires careful attention to participation. One lens that is helpful in identifying sets of interests and stakes in water management is scale. Many water-related services have level-dependent elements or are subject to strong cross-scale interactions which if taken into consideration through representation may lead to more constructive politics in deliberative arenas. Thus, if a disadvantaged group, with strong level-dependent interests and stakes is being ignored or sidelined in policy and negotiations it makes sense for conveners to find ways to include them.

Format and venues

Scale politics has shaped the format, venues and procedures of dialogues and assessments. The regionalization efforts in Mekong Agreement, Basin Development and hydropower cooperation cases have been challenged by farmers, fishers and civil society organizations as not giving sufficient attention to local place-specific impacts, interests and concerns. Such groups have used mass media and created alternative events to comment and provide alternative perspectives on development.

Venue and language choices empower different stakeholders. For the cases we studied, however, physical venues continue to be largely convention halls, government offices, or big hotels in capital cities. Interests aligned with large spatial levels are usually favored by such settings. In the Mekong Region, several of the case studies described, illustrate the value of allowing periods for discussion and reflection in native languages as these improve content and level of engagement in discussions.

Quality facilitation is crucial to give fair opportunities for everyone present to meaningfully participate and to ensure claims and arguments can be queried, verified or countered. Many sessions in dialogues and consultations with stakeholders remain dominated by formal presentations by the conveners; opportunities to query and discuss key issues in-depth are contained to short periods before lunch. Facilitators in the Mekong context need to not just consider language, but also power and influence associated with positions, and in response deploy tactics to allow different stakeholders to engage without being crushed by the articulate or influential.

Conveners have also tried to respond to debilitating effects of some form of scale politics. In the Water Futures dialogue process, the main regional dialogue focusing on transboundary issues and multilateral agencies was held separately from several national level events, but with some cross-participation. One of the rationales for these activities has been to try to create more direct conversations among actors with strengths and capabilities at different levels. Some conveners will adopt tactics like keeping some groups of stakeholder of very even capacity, power or highly polarized positions in separate events or tables during part of the process.

Most of the cases we studied indicate the need for, but challenges in, carrying out meaningful multi-level conversations without undermining credibility, salience or legitimacy. In deliberative engagements some actors, including conveners, continue to exercise power through controlling where, when and how deliberative engagement takes place and what levels are on the table for scrutiny and discussion and which are taken as given.

Content

Scale politics has shifted agendas and substantive content of deliberations. The processes of scaling and leveling have been prominent. On the one hand leaders in government, business and financing incessantly about regional geometries -- growth quadrangles and corridors, water and energy grids. A pertinent example is the promotion of a Thai Water Grid by then Prime Minister Thaksin Shinawatra of Thailand in which diversions and withdrawals from neighbouring states are glossed over by labelling a National project when it is convenient to do so (Molle and Floch 2008). These discursive practices shift agendas to larger level interests and associated technologies and projects. The rescaling of regions via large infrastructure projects also involves levelling. Local uses of water resources for irrigation and fishing are simply made invisible by a high, regional, vantage point and the statistics or policies operating at the level. Our case on cooperation in energy and water is a strong example of this form of scale politics affecting the content of conversations. The Mekong Agreement case is another, in that the focus on allocation among states has made invisible many of the within-state allocation issues.

Problems with access to, and the quality of, scientific knowledge has been an important constraint in several of the cases we examined. The MRC, for instance, has had a history of suppressing access to reports, preventing its own scientists from speaking about their findings in regional events, and avoiding disclosure of information it feels might be ‘sensitive’ to member governments. On the one hand this is seen as careful management, and the other it is seen as a lack of transparency. The tensions between international and state-level as well as state and more local levels is part of the explanation for these constraints on the content of deliberative engagements in the region.

Even so, new understanding or awareness of issues from increasingly independent research capacities in the region are countering efforts that would seek to compress issue-management into a particular scale and level. For example, the river basin scale may suit surface water flows, but be a poor fit for aquifer management issues that arise as use of groundwater expands. Likewise, climate change requires action within, but also beyond the boundaries of any sub-global polity.

Some conveners have tried to create constructive discussion about cross-level and cross-scale issues through structuring who speaks in which session and mix of topics covered in meeting agendas. The Water Futures case, for example, had a multi-level scenario building exercise that encouraged participants to grapple with development issues at several spatial levels, first separately, and then together (Foran and Lebel 2007).

Deliberative engagement activities like dialogues and roundtables can help deal with scale issues by querying choices of scales and levels. They may be particular important when they draw attention to vulnerable and disenfranchised stakeholders with limited access and influence via other political channels.

Outcomes

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Scale politics has altered impacts and outcomes of deliberations. In our first example, negotiations produced a lop-sided and weak RBO. In our second example, subsequent activities under agreement were resisted by agencies within states with result that detailed commitments or follow-up actions, for example in domestic legislation did not eventuate. Deliberative engagement among diverse stakeholders cannot be expected to reach consensus or address all the challenges in making policy and institutional changes. But it should at least improve mutual understanding among actors, allow exploration of alternative options, help define rights, risks and responsibilities and have some constructive influence on future behavior (Dore 2007). Some disconnects will persist in part because of scale and level-dependent interests and power.

Conveners have tried to manage some of the politics of scale in deliberative engagement. As planning processes are often iterative there may be opportunities for conveners to come back and evaluate the influence of findings from earlier rounds of deliberative engagement. For example, the Water Futures regional event included an evaluation and debate about just how well ADB's policies on paper, like the one on "Water for All", was actually being used in investment projects (IUCN et al. 2007b).

Overall, attributing, or attempting to measure, the impacts of deliberative engagement on policy-making processes, negotiation outcomes, and institutional forms is not a straightforward exercise; making strong claims about level-sensitive variations is even more difficult. Additional conceptual work is needed on how to best delimit deliberative activities into meaningful units of analysis and characterize their features so their evolution can be clearly described and alternative initiatives can be compared (Pingree 2006). More work is also needed on using scale as a lens to describe political interactions in more mechanistic ways (Lebel et al. 2005; Young 1994). This work can build on the findings here that show important scale politics is not only evident among the formal institutional arrangements but also found in the less formalized and often loosely connected world of dialogues, consultations and roundtables that make up the essence of a lot of deliberative engagements.

Conclusions

In the Mekong Region water governance is multi-level and multi-scale, but with many disconnects. Actors draw on both formal and informal institutions as well as more ad hoc arrangements at different levels as issues move between relatively exploratory and more decision-oriented arenas and practices. Actors also push and pull issues up and down levels to where they have more influence and power – a process of rescaling or levelling. This is underlined by the contested meanings of even the notion of a Mekong Region and the set of water resources to be considered.

There are many "Mekongs". The interests of investors, officials in government agencies, and small, local users of water, such as fishers and farmers, or distant city dwellers needing energy are visible or not depending on how boundaries are set. Likewise, there are many 'waters'. From flood protection and energy production services through to meeting needs of farmers in the dry season and securing valuable fisheries, there are correspondingly very different ways of valuing and prioritizing uses and users.

Scale politics can affect who participates, the format, the content and outcomes of deliberative engagement. Informed, multi-stakeholder deliberations that are sensitive to multi-level interests on similar or different scales appear crucial to influencing powers, challenging re-framings of issues and stakes, and negotiating for or protecting the interests and needs of minorities, women, migrants and diverse groups of the poor. Deliberative engagement also appears crucial to navigating the complex contests over rights to, and responsibilities for, water which it not as easily contained within single, neatly defined, basin boundaries.

Many important decisions about water are still made in non-transparent ways. Meaningful, public deliberation is still the exception rather than the rule. Among early efforts deliberative engagements vary hugely in inclusiveness, quality of content, structure, and how they are facilitated. As a result the quality and influence of those conversations and relationships varies. Dialogues, good and bad, broad and narrow, may all influence negotiations that help shape allocation rules that are crucial to improving water governance.

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Deliberation, scale and the governance of water resources in the Mekong Region

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Using holistic scenarios to re-write rural futures
Tira Foran

Table of Contents

I. Abstract

This paper introduces holistic scenario analysis as a method with potential to inform water-related allocation disputes, in particular disputes driven by different approaches to defining rural development.

In the Mekong region, qualitative and quantitative options analysis often gets labeled "scenario" analysis. Our focus however is on the use of holistic (i.e., comprehensive, qualitative) scenario analysis. Such applications are still limited in the region, but in three locally-oriented cases we review, they made modest contributions to water-related policy processes. The scenarios consisted of more- and less-desirable variations around the status quo, with the final scenario in the set conveying a particular "pro-local" vision of rural development.

Scenarios, as structured sets of narratives, can influence policy change when they are used in competitive rhetorical action. In the present Mekong development context, multi-stakeholder scenario building activities can help inform pro-poor development. Informing development can be done by generating transparent and well-reasoned counter-narratives, as well as guiding actors in their search for robust policy and project-level interventions. The review discusses content that should be covered for pro-poor rural scenarios, as well as process design choices and trade-offs involved in linking scenarios to policy clients.

II. Scenario Analysis and its Uses

Scenario analysis refers to processes and techniques of generating insight about different ways the future might unfold. Scenario analysis is used in very diverse ways by a diversity of actors (Lebel 2009; van Notten et al. 2003). In the business sector, scenarios have long been used as a tool to explore future risky business environments and formulate strategy (van Notten et al. 2003; Visser and Chermack in press).

Organizations that work with rural communities, such as CIFOR, have used scenarios to expand the range of alternatives being considered and get people to think through what might be required to bring about particular desired futures and avoid non-desirable ones (Wollenberg et al. 2000).

Proponents of scenario methods argue that they can be designed to:

- facilitate social learning among actors, possibly resulting in common understandings, new policy narratives, and social connections between actors (Da Costa et al. 2008);
- empower local people (Wollenberg et al. 2000; Thongbai et al. 2006 Enfors et al. 2008);
- support public participation processes (Foran and Lebel 2007; Patel et al. 2007) and embed participation in policy making (Da Costa et al. 2008);
- identify robust development interventions at local level (Enfors et al. 2008);
- support robust decision making by policy actors (Chermack 2004; Da Costa et al. 2008)

Scenario analysis is broader than modeling

The word "scenario" is commonly – and somewhat confusingly – used to refer to what is actually a "policy alternative" or an "alternative case." And thus scenario analysis is often used to refer to what is actually modeling or case study analysis. Modeling methods explore the effect of changing parameter values of a narrow range of focal variables. In the Mekong region, examples of modeling or strategic analysis (which use the term scenario) include:

- Hydrological scenarios commissioned by the World Bank as an input to the MRC's basin development planning process ("BDP") (Podger et al. 2004; World Bank and ADB 2006);
- A strategic environmental assessment of Vietnam's hydropower development plans (Soussan and Nilsson 2009)

In the Mekong region, policy makers are much less familiar with scenario analysis conceived as the **systematic exploration of different types of processes across a wide range of uncertainty** (including processes from more than one policy sector and level of analysis).

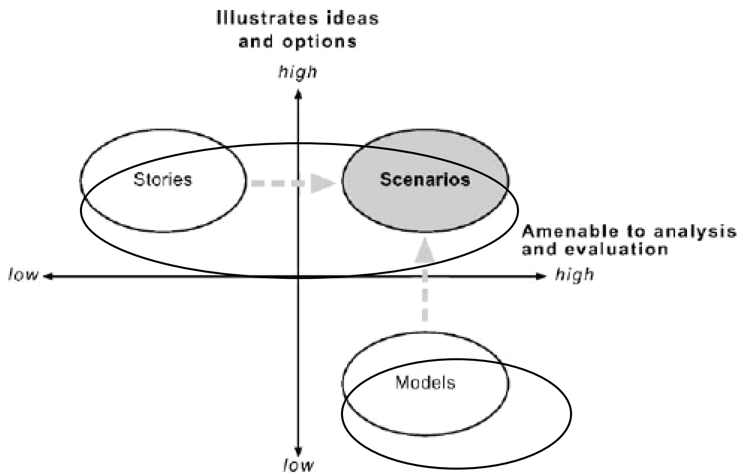
Conceived in this way, scenarios are not predictions, forecasts, or model runs. Rather, they are plausible stories about how the future might unfold, stories with explicit narrative structure.[1]

The goal of formal scenario analysis (also referred to as **foresight analysis**) is to generate contrasting stories of what the future of a geographical area, or a policy sector, or an organization might look like, depending on plausible combinations of known, but uncertain social and environmental forces. The analyst gains insight in the contrast *between* alternative stories.

[1]Models have a narrative structure, but that structure is usually implicit.

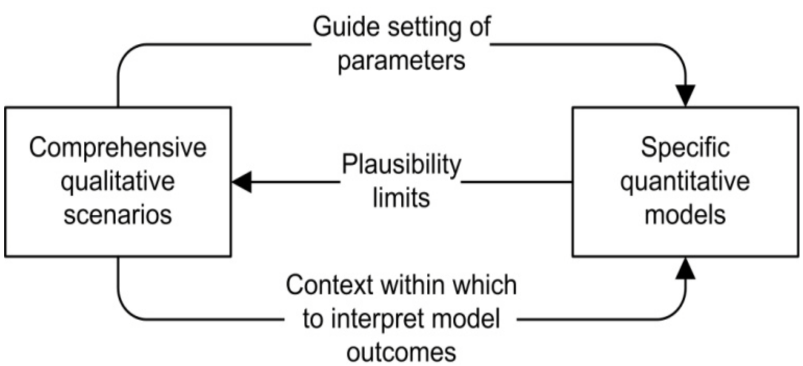
Figure 1 shows the essential difference between scenarios and models, and Figure 2 shows how they can be used to complement each other. This review focuses on the use of rural development scenarios, with an emphasis on holistic scenarios (i.e., "qualitative and comprehensive" scenarios in Fig. 2).

Figure 1 Essential difference between scenarios, models, and stories



Source: adapted from Ghanadan and Koomey (2005). Note: What makes a "story" more amenable to analysis and evaluation chiefly involves the degree to which assumptions of causality are transparently communicated. One way to do so is to develop multiple stories which can be contrasted in a structured manner. Models may have higher internal validity than scenarios.

Figure 2 Ideal relationships between scenarios and models



Source: Lebel 2009

2.1 Holistic scenarios

Good scenarios are rigorous, self-reflexive narratives: they attempt to be internally coherent, to incorporate uncertainties, to be explicit about assumptions and causality (Foran and Lebel 2007; Lebel 2006). When people produce holistic scenarios they *portray* social change, highlighting important processes, both likely and uncertain. The word "portrayal" suggests oral and written representation as well as visual imagery. Visual imagery can be an effective way to convey the essence of a set of scenarios (see Figure 3).

Figure 3 Four scenarios for the future of Makanya district, Tanzania

Source: Enfors et al. (2008). Notes: This study argued that policies to reduce risk and support farmer innovation (such as micro-credit and knowledge exchanges) would be robust across the range of futures captured in the scenarios (2008: 53). '"Agricultural advance" describes a future dominated by a rapid market-oriented agricultural development. In "Managing on the margins," the dry climate makes farming-based livelihoods difficult and people have to struggle to provide for their families. "Community cohesion" centers on collective action and small-scale improvements of current farming systems. "Industry imperial" describes a future where 'smallholder farming loses importance as people start working in industries and factories . . . .' (2008:52).

Power of Narratives

The notion that scenarios involve a structured form of story-telling directs us to pay attention not just to the coherence of their reasoning about social change, but also to how they work as narratives, and how narratives work in policy making.

The construction of policy narratives is ubiquitous: there is no shortage of state and NGO-led planning exercises in the Mekong. Each of these development interventions comes with some statement of what the future should be like. Scenarios must somehow link to these policy narratives to be relevant. Hence to influence and improve governance it is worthwhile thinking about scenarios as candidate policy narratives.

Narratives on social reality perform important political tasks: they simplify complex reality through representational and rhetorical devices such as metaphor, analogy, historical references, and emotional appeals (Foran 2006). Story-lines (that is, simplified narratives) form the basis of political coalitions. As Hajer (1995) explains: "shallow and ambiguous" by character, story-lines allow diverse actors to "expand their own understanding and discursive competence." They are "discursive cement that creates communicative networks between actors with different or at best overlapping perceptions” (1995: 62–63). Simplifications allow concrete policy action and problem closure.

For example, Friend et al. (2009) argue that in the Mekong Region, an enduring narrative of wild-capture fisheries decline exists, with four distinctive storylines:

1 wild-capture fisheries are an open access resource which must inevitably decline in the face of population growth and development;

2 fishing is a marginal activity with limited potential for generating economic development;

3 aquaculture can and should replace wild-capture fisheries;

4 it is necessary to trade-off sustainable wild-capture fisheries for economic development.

The fisheries decline narrative justifies a variety of state-sponsored development interventions such as wetlands reclamation, hydropower development, reservoir construction, aquaculture promotion, and fisheries stocking (Bush 2004; Molle et al. 2009).

Friend et al. (2009) critique and rebut each of these storylines. Against (2), for example, they argue that in southern Lao and Cambodia, agriculture and fisheries are intertwined and ubiquitous activities, to the extent that it is more accurate to think in terms of river- and wetland-based livelihoods, not rice-based livelihoods (2009: 322).

Recognizing the power of the dominant – but questionable – fisheries decline narrative, Friend et al. (2009) argue that the need exists to construct a more nuanced and hopeful counter-narrative, or, as they put it, a "future scenario" of how:

> . . . fisheries and the people who depend on them can contribute to setting development objectives. . . a future scenario in which fisheries are not merely a resource of conservation value, but a resource whose management is central to meeting the varied developmental challenges of the Mekong River Basin (2009: 325).

This appeal to "scenario" motivates us to explore whether holistic scenario analysis is in fact a useful method to re-image and re-write the future.

Scenario building can enhance an organization's decision making by uncovering and challenging the assumptions managers use to make decisions. These assumptions are embedded in policy narratives and associated mental models. Existing narratives and models may be inadequate with respect to how they treat uncertainty, or they may be poorly matched to reality (Chermack 2004:307).

Among the scenario applications that helped create and amplify new policy narratives, some of the most prominent were organized in South Africa during the final years of apartheid. These include two well-resourced projects led by the private sector in the late 1980s, and a university-led MSP (the Mont Fleur process) initiated in 1992 (Galer 2004). The Mont Fleur MSP included leftist academics and (patiently recruited) members of the liberation movement. Participants agreed that South Africa was facing an interlocking political, economic, and social crisis, and that simultaneous intervention was needed to avert further deterioration. Participants generated several dozen draft scenarios before narrowing them down into four scenarios for the future of South Africa.

III. Holistic scenarios: use and significance in the Mekong Region

In the Mekong region, the construction of normative rural development vision *narratives* is a relatively common and accessible practice. It is part of routine development practice. In Thailand, "localist" narratives, critical of mainstream development, and championing self-reliance, became more popular after the Asian financial crisis of the late 1990s (Parnwell 2005).

The construction of quantitative *models* that explore rural development issues is slightly less common and accessible, but also an area of active practice, particularly among economists. The construction of *scenarios* – narratives that capture and explore uncertain drivers – is less common, as noted above. Key actors championing the use of holistic scenarios are the World Agroforestry Center (ICRAF) and Chiang Mai University, Unit for Social and Environmental Research (USER).

This section reviews three applications of holistic, rural development scenario analysis in the Region. In general, scenario applications can be classified in terms of their **goals,** their **process design** and their **content** (van Notten et al. 2003). Scenario methods and applications are flexible in terms of how they develop each of these dimensions. Tables 1–3 summarize these features for the reader.

3.1 A scenario-building multi-stakeholder process in Northern Thailand

Chiang Mai province, Northern Thailand has been the site of a number of upstream/downstream conflicts between water users in tributary catchments. In the Mae Chaem watershed, upstream farmers growing maize, soybeans, shallots and other commercial crops have been framed by authorities and downstream users as causing stream pollution and soil degradation.

Upstream users have less power than downstream users because of their ethnic minority status, and also because they may live or farm on land which the national government has claimed as protected areas (Thongbai et al. 2006). This scenarios project was part of an ongoing development intervention called the "alternatives to slash and burn agriculture" project. The scenario application took the form of three expert-supported scenario building workshops. The application can also be considered a multi-stakeholder process (MSP) in that it aimed to create dialogue between local authorities, NGOs, and a representative sample of villagers (Table 1). Prior to the participatory scenario work, experts at ICRAF and Chiang Mai University, Unit for Social and Environmental Research (USER) conducted a regional-scale scenario analysis, which Thongbai et al. subsequently compared to the results of the local level scenarios (2006: 9-10).

Outcomes

Although the project's stated goals were modest, consisting of exploration and experiment, Thongbai et al. report a significant breakthrough in cooperative management of local water, soil, and forest resources. This began during the second workshop when "all parties admitted they had equally caused damage" to the watershed. Participants agreed that one of three scenarios produced was most desirable. This consisted of a localist, yet outward-oriented scenario containing "more alternatives and sustainable, diversified activities":

> S3: . . . adopting organic farming or other high-value crops with less land required, using indigenous knowledge and beliefs to conserve forest and natural resources . . . reforestation using native plants . . .

> eco- and cultural tourism to generate more incomes, and more self-awareness, co-operation and participation . . . . As a consequence, landscape and natural resources will be restored . . . independent livelihoods and well-beings, self-esteem and cultural identity will be sustained . . . . (ibid, p. 8)

Participants formulated a consensus set of recommendations to local authorities (2006: 8, 9). At the end of the process participants reported an **increase in problems-solving capacity** and a **sense of empowerment** (see Table 1).

Table 1 Mae Chaem scenario building MSP

Goal of scenario work (exploration v. decision support)	Exploration
Inclusion of norms Vantage point (forecasting v. backcasting) Subject (issue-, area-, or institution-based) Time scale Spatial scale	Yes Forecasting Area and issue (livelihoods, government forest policy, land tenure) Medium-term (20y) Local
Process Design (intuitive v. formal analytical)	Intuitive because participatory (Expert scenario workshop followed by 3 participatory workshops (n=25) well distributed among social categories such as gender, age, sector, upstream/downstream)
Participation: Mode / Level Data (qualitative v. quantitative) Data collection method (participatory v. desk) Resources (limited v. extensive)	Direct / High (MSP) Mixed Mixed Extensive (multiple workshop events supported by national experts)
Scenario Content (complex v. simple) Variables: sector Thematic variables Variables: actors Dynamics (events and processes [drivers])	Complex Rural development Sustainable small holder agriculture; education and diversification; cultural identity Small farmers and state agents Increasing household expenses; declining natural resource base; changing regulatory regimes Snapshot Moderate (BAU, agrarian decline, agrarian renewal)

Temporal nature (sequential or snapshot) Range of possible futures Level of interaction between variables	Moderate?
Outcomes (in terms of stated goals) Introduce concept and scenarios process Explore methodologies of participatory scenarios for NRM and planning Validate the method	 Y Y Y
Other outcomes (evident and inferred) Changes in positions (discourses) Changes in policy narratives Increases in social capital New agreements between disputants Empowerment Support for future use of method	 Y Y Y Y Y Not known

Source: Author's analysis. Notes: First column refers to choices in a typology, adopted from (van Notten et al. 2003). "Change in policy narrative" includes change in understanding and social learning. "Not known" means data insufficient to determine.

3.2 Scenarios for Pak Mun Dam's operations

In April 2001, in an attempt to resolve a long-running conflict between hydropower production and fisheries impacts from Pak Mun Dam, the Thai government under PM Thaksin Shinawatra ordered the dam's operator to open all eight sluice gates of Pak Mun Dam for four months, May-August. It also mandated Ubon Ratchathani University to conduct a multi-disciplinary study on the impacts of opening the gates (UBU 2002). This study was one of several exercises in knowledge production, all of which unfolded in a highly contested setting (Foran 2009; Foran and Manorom 2009; Ubon Ratchatani University [UBU] 2002). The UBU research team began presenting findings in September 2002. The final section of the 6900-word executive summary presented four alternatives:

(1) Maintaining the status quo (maximize electricity production; sluice gates normally closed);

(2) A five-month seasonal opening;

(3) An eight-month opening;

(4) A year-round opening for five years (no electricity production)[2].

We can consider UBU's four alternatives as a set of **expert-led, decision support, normative scenarios**. The structure of the executive summary – a linear examination of the strengths and problems of the first three options, before concluding with the last – suggest that the authors preferred the five-year opening option:

> Alternative 4. Opening the sluice gates year-round. This Alternative follows from the consideration that many technical solutions to the Dam's problems in electricity generation can be found, by obtaining auxiliary energy from other sources in the country and/or importing energy from Lao PDR. **However the problems of community economics do not quite have solutions, and are not solvable by technical means**. The Dam has affected poverty and natural ecosystem in fertility in a manner not possible to deny. Problem solving for more than 8000 households (a figure estimated by the study team, differing from the 6,176 households that received compensation by EGAT) will require the resources, cooperation, and time of many concerned parties.
>
> As well, electricity generation is not an urgent necessity at this time. This is because upon consideration of the role of the Dam in the stability of electricity system, electricity supplied to the Ubon Ratchatani zone (including Mukdahan) comes from many sources. Even if the Dam does not generate any electricity, stability of electric current is not negatively impacted.
>
> However, the government might consider [these issues] in regard to state investment. . . .
>
> Economic growth, especially growth from industrial development that requires electric energy has not yet developed as forecasted. The Dam does not yet play a full potential role in irrigation. It is appropriate to direct benefits from the Moon River basin to community-based economics by ceasing use of the Dam for electricity generation for now, until electricity demand changes from current conditions.
>
> This period, during which electricity generation by the Dam halts, will provide benefits of restoring ecological conditions, economics, and community livelihood. Villagers will be able to access fishery resources throughout the seasonal round. They will be able to use a variety of fishing gear (each household tends to have a variety of gear) to catch fish following the seasonal natural cycle of the Moon River. In addition, opening the sluice gates year-round will give community is the confidence to invest both capital and labor [in fishing]. Restoration of

[2] UBU argued that for at least another five years, the dam's chief benefit, improving electric power reliability in the lower Northeast, could be substituted by increasing electricity imports.

> nature will occur, as well as restoration of community livelihoods founded in their original locations.
>
> Initially, opening the sluice gates year-round might occur for a period of approximately five years, coinciding with economic forecasts predicting that electricity demand will not change greatly, or if it does change, can be adequately met by other sources. During this time, there should be preparation to obtain irrigation benefits from the Dam, by thorough and detailed surveying and study. Consideration needs to be given to conditions mentioned above: building basic infrastructure, policy-making regarding agricultural crops grown in irrigated areas, and cooperative management, the capacity for which many communities already have.

(UBU 2002: *Khor* 17-18; emphasis added)

The UBU scenarios were generated by *expert interpretation* of a large and complex study, drawing in particular on findings about community social relations; local farming systems; fisheries incomes; fisheries catch per unit effort during the experimental dam opening; electric power flow analysis; and a stakeholder consultation organized with local leaders (village headmen and TAO members). The scenarios attempt to *support decision making* in that they focus on one key variable (dam opening and its impacts) while other uncertain drivers (such as the sustainability of small holder farming) are treated in less detail. The scenarios are *normative* in that running through the UBU Executive Summary is the normative storyline that technical substitutes exist for goods provided by the dam, but none exist for improving the security of community-based livelihoods (UBU 2002). The explicit prioritization of community-based livelihoods over energy security is a public policy argument which leads to the conclusion that any significant opening is preferable to the status quo. As noted above, the problem-solution structure of the text ends with Alternative 4 as the authors' implicitly-preferred solution.

Outcomes

Normative scenarios can be an effective way to synthesize and communicate the key findings of a long study. The UBU scenarios did succinctly capture a spectrum of strategies with respect to Pak Mun's future operations, and also discussed drivers such as state investment in integrated agriculture and irrigation.

Some critics of the study complained that the Executive Summary was too long, and that the alternative scenarios were confusing. They did not offer a single, explicit set of policy recommendations (statements made at consultation on final draft study, Ubon Ratchathani, 6/9/2002).

Quite aside from the alleged complexity of the scenarios, it is worth noting that by 2002, stakeholders had long aligned themselves into two discourse coalitions, holding opposite policy narratives on the value of Pak Mun Dam (Foran 2006: ch. 6, 8). In general, during the history of the conflict, three policy narratives on the future of Pak Mun Dam circulated:

> (1) [Beginning 1991] The dam should be built and continue to operate, but additional efforts at reservoir stocking and livelihood restoration are needed;
>
> (2) [Beginning 1999] Decommissioning is needed to restore migrating

fisheries;

(3) [Beginning 2002] A four-month wet season opening is sufficient to allow fisheries migration, and also allows dry season water storage.

Two broad clusters (i.e., heterogeneous groups) of actors deployed these narratives: a mainstream cluster and a critical cluster (see Foran 2006: chapters 6-7). Thus different actors interpreted UBU's four alternatives in different ways, to argue their respective positions.

Pak Mun's most vocal supporters – including some print and radio journalists) – accused the authors of the Executive Summary of siding or actually conspiring with anti-dam activists. Dam opponents – including some legislators and human rights commissioners – found it useful as an authoritative statement. In particular they seized on the study's finding that the dam was not essential to meeting electricity needs and used this as a public debating point with senior EGAT management at a November 2002 seminar organized by the Senate Committee for Public Participation. An admission by the EGAT governor that lower Northeast Thailand's electricity demand could be reliably met by imports in turn led UBU's president to change his position, and call for a year-round opening (Foran 2006: 232, 233).

As noted above, the UBU study was one of several exercises in knowledge production. Elites who aligned with the mainstream discourse coalition could refer to several other studies – as well as common-sense lay discourse – to formulate their positions (Foran 2006: ch. 7; Foran and Manorom 2009). But among the rival studies and associated policy narratives, the UBU study was unique in that it presented one crystallized set of alternatives which took seriously the prior policy narratives critical of the Dam.

In summary, the politicized arena significantly limited the impact of the UBU study and its synthetic scenario analysis. But it did not prevent the main messages of that analysis from reaching decision makers, including those whose positions were subject to change.

Table 2 Pak Mun scenario application

Goal of scenario work (exploration v. decision support)	Decision support
Inclusion of norms Vantage point (forecasting v. backcasting) Subject (issue-, area-, or institution-based) Time scale Spatial scale	Yes F Issue and area (livelihoods, multi-purpose dam operations) Short-term (5y) Local
Process Design (intuitive v. formal analytical)	Not known
Participation: Mode / Level Data (qualitative v. quantitative) Data collection method (participatory v. desk) Resources for scenario work (limited v. extensive)	Indirect (expert-conducted) / Medium Mixed Mixed Extensive (multi-disciplinary study + one synthesis workshop)
Scenario Content (complex v. simple) Variables: sector Thematic variables Variables: actors Dynamics (events and processes [drivers]) Temporal nature (sequential or snapshot) Range of possible futures Level of interaction between variables	Simple Rural development Community-based livelihoods; fisheries; irrigation; value of hydropower; migration Small farmers, electricity utility, state agents responsible for agricultural development Declining natural resource base; ecological restoration; agricultural intensification; changing dam operation regimes Snapshot Moderate (BAU, agrarian decline, agrarian renewal) Moderate?
Outcomes / Effectiveness	
In terms of stated goals Decision support	 Y
In terms of other outcomes Changes in individual positions	 Y [see Foran (2009)]

(discourses) Changes in policy narratives	Y (Five-year opening = new narrative)
Increases in social capital	Y (between study team & AOP)
New agreements between disputants	N (final decision imposed by force)
Empowerment	Not known
Support for future use of scenarios method	Not known

Source: Author's analysis.

3.3 Songkhram basin: scenarios under the banner of E-Flows

In the Songkhram basin, an "environmental flows" study conducted by the Mekong Wetlands Biodiversity Program (a collaboration between lower Mekong governments, IUCN, MRC, and ADB) included scenario building as part of its methodology. The extensive floodplain of the lower Songkhram is noted for its high biodiversity, flood pulse ecosystem, and wetland-dependent livelihoods. The basin has not experienced the high-intensity conflicts of the lower Mun basin. However Thai government plans since the 1980s (most recently under RID) to build dams and weirs throughout the basin, and especially large structures in the lower basin, have been challenged as inappropriate by environmental NGOs and by environmental arms of the state. Equally important, smallholder famers have expanded rice and (more recently) eucalyptus onto the floodplain. Some agribusiness operations, aided by official policies of intensification, succeeded in privatizing large tracts of previously common property on the floodplain, although some ensuing agribusiness operations were not successful (Blake et al. 2009).

In addition to the challenges outlined above, the Songkhram basin lacks an integrating river basin organization (RBO). Instead, the basin falls under the jurisdiction of four provincial governments and six sub-basin committees (modeled after RBOs) (Blake n.d.-b).

During the 2000s there has been a growing interest in environmental flows assessment and planning as one way to implement principles of integrated water resources management model (IWRM). Environmental flows (also referred to as "E-Flows" in the Mekong) has been promoted by organizations such as IUCN as a participatory, deliberative, ecosystem-based approach to IWRM, which otherwise might continue to be dominated by economic and engineering approaches (see Dyson et al. (2003).

Table 3 summarizes the features of the E-Flows scenario work conducted by MWBP in the Songkhram. The process design consisted of an expert multi-disciplinary environmental flows assessment, followed by one expert scenario analysis workshop, followed by one multi-stakeholder dialogue event.

Expert scenario workshop

The E-Flows team consisted of national and international experts in fields such as hydrology, fisheries, botany, and agriculture. As an input to the expert workshop, four qualitative development scenarios were prepared by project coordinator David Blake:

(S1) Building two controversial floodplain dams: the Nam Songkhram and the Nam Oon;

(S2) Building a Water Grid in Northeast Thailand (including Lao-Thai water transfers, but not the S1 floodplain dams);

(S3) Business as Usual: agricultural intensification, many small infrastructure projects, no major projects;

(S4) Implementing an Alternative Development Paradigm: shift to sustainable (low external input) agriculture; focus on demand-driven water resource development; shift to informed, bottom-up, precautionary decision making; shift to internalizing impacts of rural development (Blake n.d.-a).

The first three scenarios shared the dominant (mainstream) storyline that rural poverty alleviation requires additional irrigation infrastructure. The first two scenarios were presented in relatively simple terms, consisting of different levels of one focal variable, which was water infrastructure development (irrigation and flood control structures).

The latter two scenarios were more complex. S3 was motivated by a detailed analysis of trends since the 1970s (see Table 3: Dynamics), and assumed continuation of those trends. S4 assumed a reversal of those trends, implementing a new and genuinely participatory RBO receptive to existing policy narratives about integrated agriculture (Blake n.d.-a)

Table 3 Songkhram scenario application

Goal of scenario work (exploration v. decision support)	Mixed: exploration (E-flows assessment); decision support (multi-stakeholder dialogue event)
Inclusion of norms Vantage point (forecasting v. backcasting) Subject (issue-, area-, or institution-based) Time scale Spatial scale	Yes Forecasting Issue (sustainable livelihoods, irrigation development, wetland ecosystems) 20y Local (3 village sites) + Sub-regional (lower Songkhram Basin)
Process Design Intuitive v. formal analytical	 Formal (at level of overall study)
Participation: Mode / Level Data (qualitative v. quantitative) Data collection method (participatory v. desk) Resources for scenario work (limited v. extensive)	Indirect (expert-conducted) / Medium Mixed Mixed Extensive
Scenario Content Complex v. simple Sector Thematic variables Actors Dynamics (events and processes [drivers]) Temporal nature (sequential or snapshot) Range of possible futures Level of interaction between variables	 Complex Rural development, wetlands ecosystem management Water infrastructure; wetland habitat, goods, and services; irrigation; community-based livelihoods Small farmers, irrigation and agricultural development agencies, politicians, agribusiness Loss of upland and wetland forests; agriculture and fishing intensification; wetlands conversion; ecological restoration; decisions to invest in water infrastructure ; altered flow regimes Mixed Moderate (BAU, ecological decline, ecological renewal) Moderate[1/]
Outcomes / Effectiveness	
In terms of stated goals Capacity building (in E-Flows	 Y

methodology) Knowledge production Multi-stakeholder dialogue	Y Y
In terms of other outcomes Changes in individual positions (discourses) Changes in policy narratives Increases in social capital New agreements between disputants Empowerment Support for future use of scenarios method	 Not known Y (New justification for existing narratives) Not known Not known Not known Not known

Source: Author's analysis. Note: 1/"moderate": cross-sectoral interactions recognized but not fully modeled.

The qualitative scenarios summarized above then fed into an expert workshop aimed at describing how each would affect the "river flow regime." This flow regime was first defined in terms of how the development scenario would alter, if at all, a detailed list of "critical hydrological flow events", ranging from dry season low flows to large class inter-annual floods.

Interestingly, the lower basin floodplain dams scenario (S1) had the largest impact on the hydrological flow events, not the Thai Water Grid scenario. However, Scenarios 1–3 all resulted in significant negative ecological impacts. Discussion of social changes focused on negative impacts, which ranged from loss of floodplain food and livelihoods and declines in water quality (under BAU), to forced resettlement (S1), to a shift to high-capital, high-risk farming systems with attendant landholding consolidation (S2). Time limitations prevented full analysis of ecological and social impacts, or discussion of Scenario 4 (Blake n.d.-a).

Multi-stakeholder dialogue

Key findings from the E-Flows assessment and expert scenario workshop were presented to participants at a day-long dialogue meeting held in May 2007, which the author attended. Participants included representatives from national, provincial, and local governments, academia, civil society, and local communities (Blake n.d.-b; see also Blake, PN67 Case Study. The meeting was conducted in Thai and chaired by a professional facilitator from Thailand Environment Institute.

The meeting included an afternoon two-hour small-group qualitative scenario-building activity. At the beginning of the day, participants were given a briefing paper, summarizing scenarios S1–S4 from the expert workshop. During the small group activity, they were invited to review scenarios S1 and S3, both scenarios of wetlands loss and agricultural intensification.

Participants were asked to discuss "the current situation, including problems in different dimensions, and to offer clear approaches to solve or mitigate those problems" (Blake n.d.-b) [pp. 8, 11]. Small groups then reported in detail back to plenary. Plenary discussion also included the sharing of sustainable development vision statements, which emerged as counter-narrative to the intensification scenarios discussed.

Some of these sketches were highly idealistic with respect to the sustenance of ecosystem based livelihoods. However, they emerged from lengthy preceding discussion of the basin's multiple development trends, and can be considered plausible.

Outcomes

With respect to stated goals, the E-Flows assessment (including the expert scenarios workshop), was successful in capacity building among the study team. For instance, after immersion in the hydrologically-focused methodology, a social scientist on the Team eventually argued that other "flows" driving rural change, such as migration, needed to be explored in more depth. To the extent study team members are influential practitioners in the Region, the application constitutes a step towards improving practice in environmental impact assessment (EIA) and in multi-disciplinary assessment.

During the dialogue meeting, the use of scenarios helped participants focus on floodplain wetlands, an ecosystem that is of importance to poor peoples' livelihoods, and threats to those ecosystems and associated values.

Decision support was not a stated goal of the expert workshop, but the focused definition of Scenarios 1 and 2, combined with hydrological modeling findings, allowed specific policy arguments to be made: e.g., that "any attempt at upstream regulation of the Nam Songkhram or tributaries will have a negligible impact on flood control" (Blake n.d.-a:27).

Decision support for sustainable resource management, by contrast, was a goal of the dialogue meeting. The meeting report compiled multiple management suggestions from participants on topics ranging from livelihoods to ecosystem conservation to administrative reform. The meeting concluded with discussion of a draft statement calling for the establishment of a four province inter-provincial working group. The working group would seek to deliver more integrated river basin management.

IV. Comparative assessment

Context, definition and relevance

The above section reviewed three projects that involved envisioning the future of rural livelihoods in specific localities in the Mekong region. Building normative scenarios was an integral activity in all three.

In terms of **context**, in all three applications, scenario analysis was a component in a larger action research project aimed at improving forest or water resource management in contested settings.

In terms of **definitions**, the Thongbai et al. (2006) application was the most methodologically sophisticated. For example, multi-stakeholder scenario building activity was explicitly and correctly identified as a "visioning" activity (Evans et al. 2006). The compatibility of the local level scenarios with higher-level drivers was also explored in a separate step by experts (Lebel 2004).

In terms of **relevance**, in the case studies reviewed above, scenario organizers understood the tool to be directly relevant in supporting bottom-up participatory planning. It is less common for scenario exercises to document participant-stakeholder reactions. In a one-and-a-half day multi-stakeholder scenario-building workshop conducted in the region, Foran and Lebel (2007) found that some participants wanted the qualitative scenarios they built to contain more detail. Others considered the workshop a useful capacity building activity.

Scenarios and their political influence

Framing the future

Scenario building involves directly framing future states, impacts, and options, both those that are likely, sought and feared. Framing/counter-framing refer to rhetorical action[3] deployed to further a political objective. The discourse in framing/counter-framing can range from terse speech acts (fragments of narratives) to the more elaborate knowledge claims in policy narratives and scientific reports. Framing/counter-framing is a political driver – that is, a social process that contributes to political change (Foran 2009; Foran 2006; Snow et al. 1986).

The appeal of qualitative methods is that knowledgeable participants or analysts can create complex and plausible narratives, as shown in Scenario 3 from Mae Chaem, and Scenario 4 from Songkhram. The strength of these narratives is their accessibility and rhetorical appeal as visions of sustainable localist development. These eco-localist visions motivate many civil society (and some state) actors to implement community-based development, and are especially resonant in Thai democratic politics.

Improving water governance

The ability of any discrete method – including holistic scenario planning – to influence governance is always mediated by other drivers of policy processes, including competing narratives, competing knowledge brokers (Foran 2006; Foran and Manorom 2009), and associated interests.

In all three cases reviewed, use of the tool led to the development of explicit policy recommendations, which argued for increased allocation of resources to addressing the needs of marginalized small holder farmers, and re-framing top-down approaches to common property resources. In two out of three cases (Mae Chaem and Songkhram) these recommendations were legitimized by a multi-stakeholder endorsement. In these cases scenarios played a role in planning processes that were not solely distributive bargaining negotiations.

Significant findings

The review uncovered several noteworthy findings, beginning with the paucity of qualitative scenario applications in the Mekong region. Outside the Mekong, qualitative and multi-stakeholder scenario exercises for rural futures occur in a variety of settings (see Evans et al. 2006), but are still rare in the Mekong region.

[3]"Rhetorical action" refers to the competitive, strategic, monologic use of language by actors to persuade audiences of preferred courses of action (Naurin 2007).

Second, none of the three case studies solely used formal scenario methodology (by which we mean structured exploration of contrasting combinations of uncertain social and environmental forces). Rather, in each of the three cases, the qualitative scenarios were developed intuitively: either because the authors regarded their development as self-evident **(Pak Mun, Songkhram)**, or as a deliberate participatory technique (**Mae Chaem**).

The third finding is about how the scenarios were organized and presented in textual form. In all cases, the sets of scenarios produced consisted of more- and less-desirable variations around the status quo, with the final scenario in the set reading like the "preferred" one. In each case, in the final scenario, small farmers and their locally-based livelihoods are sustained by balanced commercialization and intensification (tourism, high value-added agriculture, demand-driven irrigation). Such livelihoods and cultures are also sustained by significant local empowerment and improvements in human capital. The final scenario functioned as a detailed policy narrative conveying a vision of rural development. Organized and presented in this way, the whole exercise helps legitimize the localist counter-narrative.

V. Broad implications, challenges, and opportunities

Qualitative scenario methods to explore and sustain rural futures are still rare in the Mekong region, and thus their overall impact has been limited (see Table 4 below). However, in each of the policy-oriented applications reviewed above, these types of scenario methods were an integral component.

Conditions and mechanisms for the tool to influence policy

Generally speaking, Mekong water governance has consisted of a series of policy domains dominated by elite actors, institutions, and mainstream (modernist) development narratives. Improving Mekong water governance in this context involves a host of reforms at different levels. The specific potential of scenario methods is that they offer a means to critique dominant development narratives which, as discourse, constitute powerful contextual drivers of action.

Table 4 Summary of outcomes, selected Mekong scenario exercises

Outcomes	Mae Chaem (Thongbai et al. 2006)	Pak Mun (UBU 2002)	Songkhram (Blake n.d.)
Stated goals met?	Y	Y	Y
In terms of evident outcomes Changes in positions (discourses) Changes in policy narratives Increases in social capital New agreements between disputants	Y Y (new) Y Y Y Not known	Y Y Y N Not known	Not known Y (New justification for existing narratives) Not known Not known

Empowerment Support for future use of method		Not known	Not known Not known

Source: Author's analysis

As sets of contrasting policy narratives, scenarios highlight the fact that the future is uncertain and hopefully open. In the dominant Mekong context, scenario building might be received as a type of *framing,* that is, rhetorical action that threatens to undermine dominant policy narratives (Foran 2006; see also Snow et al. 1986).

The more radical or paradigm-breaking the range of plausible futures considered, the less likely such an activity is to offer anything that policy elites focused on short-term incremental decision making perceive to be useful. (The need for sustainability transition may be urgent and credible to the analyst, but not salient to the politician.) On the other hand, scenarios by definition present a range of alternate futures, leading to a range of possible value-laded policy narratives. A scenario project may, but does not need to, conclude with one preferred vision.

The manner in which scenarios are received of course depends on the specific policy domain, and the terms on which policy elites are involved. It will be influenced by other micro-political drivers, such as media framing, elite intervention, and negotiation (Foran, 2009).

Scenarios designed to offer a reservoir of knowledge for the public might increase the range of potentially receptive audiences. A well-designed communication strategy – making use of audio and visual media deserves consideration (Da Costa et al. 2008).

Approaches to influencing governance

One approach to influencing governance is for scenario applications to link with compatible policy processes, both existing and emerging. Two obvious processes are IWRM and MSPs.

IWRM – IWRM has become a globally promoted institutional framework for water resource management. However, as an umbrella concept, it is also a contested domain (Biswas, Varis, and Tortajada 2005).

MRC is currently implementing an IWRM-based basin development planning process ("BDP"). Compared to previous exercises at MRC, the BDP program appears to be taking a more participatory turn. However, the BDP's definition of scenarios has thus far emphasized water modeling-centered applications, with implications for accessibility and transparency. Not surprisingly for an inter-governmental program, there has been limited recognition of the value of holistic scenario analysis. It would be necessary for scenario proponents to continue to seek to influence the agenda of the BDP.

Multi-stakeholder processes (MSPs) can be defined as organized processes designed to facilitate active and informed participation in particular policy issues (Foran, n.d.). Defined broadly this way, all MSP processes include both competitive and cooperative interactions. In addition, MSPs may be designed to seek common understandings of a problem, or they may not (see Foran, n.d.: Section 4.3.5).

As we saw in this review, scenario analysis is compatible with, and can complement MSPs. Indeed, a multi-stakeholder dialogue can be designed around scenario building activities (Foran and Lebel 2007). However, if actors join – or consent to an MSP – primarily to engage in *distributive bargaining*, they are unlikely to be interested in scenario building or scenario analysis. Such contested settings and cases are more likely to be the norm in the Mekong region.

In these arenas, scenarios influence policy processes indirectly, as tools to help develop logically robust policy arguments (e.g., rebutting the GMS policy narrative that connectivity builds prosperity, see Lebel and Foran 2007). Both MSPs and scenarios must answer questions of participation: whose process or scenario is this, how much room for interests of weak and less organized (Warner 2007).

Advantages and disadvantages: implications for process design

Two weaknesses of MSPs are that they can be resource intensive, and that space for participatory processes is limited in non-democratic and democratizing Mekong countries. Multi-stakeholder scenario analysis would share these limitations.

Expert-generated scenarios might circumvent both resource and participation problems. However, experts eventually need to find receptive audiences, suggesting the need to actively reach out to various policy actors (whether state or civil society) using appropriate communication strategies. Experts can directly advocate on policy reforms. Revkin (Revkin 2009) for example documents the advocacy efforts of IPCC scientists Rajendra K. Pachauri and James Hansen, both of whom have used their standing to access the mass media and promote policy prescriptions. Scenario organizers need to think about the credibility, salience, and timing of their messages, as well as the advantages and disadvantages of having other actors (such as regional media or NGOs) convey those messages (Da Costa et al. 2008). Overall, an iterative scenario process involving experts, multiple stakeholders, and carefully designed opportunities for elites, may be most effective.

In the present developmentalist context, scenario activities focusing on rural futures should offer policy or project-level recommendations that should perform well across the range of uncertain futures (see Enfors et al. 2008 for example).[4] These should be specific enough to inspire and mobilize practitioners.

Opportunities

The Mekong region during the 2000s is one where powerful actors have pursued strong interests in infrastructure and natural resources development (including large-scale irrigation, hydropower, agricultural plantations, and mining concessions). The consequences for poor rural people are highly uncertain. The concentration of activity pursued in rural areas (often justified by policy narratives about economic growth and poverty alleviation) has generated media attention, significant volumes of critical analysis and commentary by civil society actors, and – in early 2009 – a civil society campaign to "Save the Mekong."

Despite the generic challenges discussed above, scenario analysis is a method well-suited to exploring, clarifying, and re-thinking the future of small farmers in this

[4] The argument made here is that the policy recommendation (not the scenario) should be robust.

dynamic and contested region. More holistic scenario applications are needed, combining both expert and lay stakeholder input.

Wanted: More holistic foresight analysis about rural futures

Water-related decision making in the Mekong Region has been dominated by a number of potent, but simplistic, policy narratives (Friend et al. 2009; Foran and Manorom 2009). In these narratives or "story-lines", poor rural people can be lifted out of poverty by large-scale water resources development, which will make their farmland more productive; likewise, the introduction of modern inputs and practices will make their agriculture more productive. Technologies enabled by the state and other modern elements of society will reduce farmers' vulnerabilities to nature. In parallel, the integration of subsistence production into larger-scale markets will also benefit the poor. Vulnerabilities to changing market conditions can be managed through more sophisticated interventions.

Narratives of rural and agricultural development matter because most of the world's poor people still make a living in rural areas (Hazell et al. 2007). Any development intervention which can grow sectors in which the poor make a living deserves analysis. Another reason that narratives featuring market integration and technological progress need to be taken seriously is that they have worked in the past, notably in the post-WWII 'Green Revolution'. In the 2000s, food policy analysts argue that underinvestment in agriculture and rural infrastructure has produced a 'food crisis' of stagnant productivity growth and unaffordably high prices, which lead to depressed nutritional intake among poor consumers (von Braun 2008).

Although transformations are needed in the world's food systems, it is less common to hear from subsistence farmers directly; more often they are characters in stories told on their behalf, stories told and retold by policy elites and disseminated more broadly through mass media, until they have the force of hegemonic discourse.

Not only does this have sober implications for self-determination, autonomous agenda-setting, and other aspects of participation: another problem is that the stories told – no matter how well-intentioned or participatory – may be laden with questionable assumptions about how the future will unfold, how social change can be manipulated.[5]

In the case of Pak Mun Dam, proponents claimed the dam would allow productive reservoir-style fisheries to be developed, replacing migratory capture fisheries. More recently proponents attempt to link dam closure to dry season water security (Foran and Manorom 2009). In the case of Nam Theun 2, sponsors claim that dedicated livelihood restoration programs will make resettled people better off (Lawrence 2009).

Scenarios relevant to marginalized and vulnerable people would have to capture key uncertainties with respect to the future of their livelihood strategies (see Table 5).

[5] Note the gap in reasoning, between a macro-level policy narrative such as "we need to grow more food" and a local-level policy narrative such as "we need to grow more food here." The analyst needs to ask: to what extent do such narratives ignore local complexity?

For example, Table 5 shows a list of existing processes which have interacted to shape farming in Thailand, which, combined with emerging processes, will shape the future.

Many of these drivers are determined at levels higher than a specific locality. Scenario analysis ideally would also explore national, regional, and global drivers (Lebel 2006; Foran and Lebel 2007), although few examples of multi-level analysis exist (Enfors et al. 2008; Kok, Biggs, and Zurek 2007)

Fossil fuel prices, price volatility, and their economic ramifications will have profound impacts on conventional agriculture and agri-business (see Annex). Energy futures in the region therefore deserve scenario analysis as well.

Table 5 Key drivers affecting smallholder farming livelihoods in Thailand

Category of driver	Examples
Demography	growth, aging, migration, health (HYV)
Development of agricultural techniques	integrated farming, organic farming, new slow-release fertilizers, GM-crops
Energy	availability and cost of petrochemical inputs, opportunities for bio-energy production
Irrigation systems	effectiveness, cost, maintenance
Macroeconomic situation	growth rate of economy, distribution of wealth, cost of labour, commodity prices
Consumer preferences	Organic food, IPM food, geographical origin of food
Public policy drivers	trade liberalization, energy policy, privatization, decentralisation
Rural policy drivers	agriculture and rural development subsidies, micro-finance, land tenure (esp. related to wetlands and common property floodplains)

Source: Adapted from Gomez-Limon et al. (2009)

Conclusion

"Scenario" analysis in the Mekong is frequently conceived of as policy analysis focused on qualitative and quantitative options analysis. This conceptualization has the advantage of familiarity among policy clients and other powerful actors, but is inadequate as a tool to imagine and inform the search for robust solutions to long-term, complex, and uncertain futures.

This review focused on qualitative and "holistic" scenario applications – that is, applications that attempted more comprehensive analysis. Such applications are still limited in the Mekong region. In the three cases reviewed, "holistic" scenario methods dealt with a range of uncertainties affecting the future of small farmers in given localities. They produced new local area-based and issue-based policy narratives which could then be used in policy advocacy.

In all cases, the sets of scenarios produced consisted of more- and less-desirable variations around the status quo, with the final scenario in the set functioned as a detailed policy narrative conveying a vision of rural development. In each case, in the final scenario, small farmers and their locally-based livelihoods are sustained by balanced commercialization and intensification (tourism, high value-added agriculture, demand-driven irrigation). Such livelihoods and cultures are also sustained by significant local empowerment and improvements in human capital. Such desirable outcomes reiterate the need for reforms that increase downward accountability and effective delivery of resources allocated towards rural development.

Actually attaining a future resembling the one envisioned requires a set of robust interventions and enabling policies at different levels, from local to supra-national. None of the local case studies reviewed fully elaborated these co-requisites. However, future applications of scenario method could attempt multi-level analysis, with analysis of global and regional drivers led by experts (Kok et al. 2007; see also Annex).

The final section of the review discussed content that should be covered for pro-poor rural scenarios, as well as process design choices and trade-offs.

Acknowledgments

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Annex

Exploring Mekong Futures: an opportunity for holistic scenarios?

In 2009 CSIRO/AusAID developed an initiative to fund scenario projects exploring the future of water, food, and energy issues in the Mekong. This proposal was guided by a core team consisting of advocates of MSPs, holistic scenario methods, and agent-based modeling. The design consists of local case studies, which were awarded based on factors such as connections to policy making venues, clear discussion of water-food-energy linkages, and geographical representation. In addition, the project proposes to build a regional-scale agent-based model based on household level sampling. The project thus proposes to combine qualitative scenarios with the production of a new integrated quantitative model. As a contribution to this initiative, the author developed a proposal titled "Thailand's farming future in 3-D: development, democratization, dematerialization?".

Proposal (abridged version of original submitted June 2009)

Mekong Region Futures

Expressions of Interest (EOI) to undertake 'local' studies

Name of leaders/Affiliations	Dr. Tira Foran (CMU-USER), Study Coordinator [G, Ey, S] Dr. Decharut Sukkumnoed (Healthy Public Policy Foundation) [Ec, G, Ey] Dr. Shabbir Gheewala (King Mongkut Univ. of Technology Thonburi) [Ey, Eng]

	Dr. Sawaeng Ruaysoongnern (Khon Kaen Univ.) [A, G] (to be confirmed) Expertise in brackets: A – agriculture; Ec – economics; Eng – engineering; Ey – energy; F – fisheries; G – governance; S – scenario methodology.
Name of partners/Affiliations *Indicative list; full list of research partners to be determined*	Key participants: Local government: selected Tambon Admin. Organizations Farmers' networks / NGOs: selected networks and NGOs promoting integrated agriculture Central government: National Economic and Social Advisory Council; Office of Self-Sufficiency Economy; Dept of Water Resources; Royal Irrigation Dept; Dept of Alternative Energy Development and Energy Efficiency; National Economic and Social Development Board Private: Federation of Thai Industries; Social Venture Network Thailand; Thailand Development Research Institute International: International Water Management Institute; World Bank; Asian Development Bank

Title of proposed study

Thailand's Farming Future in 3D: development, democratization, dematerialization? ~ Exploring energy, water, and farming futures to the year 2050

Geographical area

Northeastern Thailand: Scenario-building workshops will be conducted in rural communities selected as exemplifying key driving forces

Context and 'nexus'

Context: During the second half of the 20th Century, Thailand emerged as one of the largest economies in mainland Southeast Asia as a result of a historically open economy, large-scale development assistance support by the U.S. during the Indochina War, and relatively successful democratization. Based on intensified fossil-derived multi-cropping in the Chao Phraya basin, it became the world's number one rice exporter. After a shift towards greater economic liberalization in the 1980s, Thailand's industrial growth, and the accompanying movement of people out of agriculture (seasonally or permanently), also quickened.

However Thailand's emergence as a large, affluent Southeast Asian country has also come with a number of governance and sustainability challenges:

- failure of agricultural development to reduce smallholder poverty; small farmers face chronic debt as a result of low-profit crop production;
- slow pace of industrialists and related institutions in capturing higher-value niches in the global economy, thus perpetuating relatively low-value added industries;
- unequal ability of people to access basic entitlements (health, justice, education), contributing to persistent poverty, income inequality, and geographic inequality
- high cumulative impacts of growth, with impacts extending beyond national borders, indicated for example by rising CO_2 emissions per unit GDP (Nguyen et al. 2007a) and problems with water quality, availability, and environmental flows.

Many of these problems are evident in Northeast Thailand (Bello et al. 1998; Molle et al. 2009a).

As it navigates the 21st Century, Thailand will face emerging social-economic-ecological tensions. These include the fragility of the political party system; administrative and policy ineffectiveness; and ongoing distributional conflicts, both within and spilling across the region's political borders. Thailand also will face exogenous uncertainties, such as protectionism in agricultural export markets, climate change, and the threat of major discontinuities in supply of imported fossil fuels. In 2110, no guarantee exists that people enjoy the same material standards they did a hundred years earlier.

Nexus: In the discussion above, relationships between energy, food, water, people, and governance are manifold and bi-directional. For example, fossil energy constrains conventional agriculture. Public policies shape bio-energy futures. Driven by populist storylines of agricultural modernization, large-scale irrigation development undermines aquatic ecosystems and dependent communities. Lack of institutional support constrains demand-side energy and water management.

Changes and decision making

Objective: To **build capacity** among policy makers and the public to examine the uncertain future of Thai farming, and to design robust, pro-poor policies.

Approach: Our project has a deliberately long time horizon. We therefore take an inclusive view towards "decision making": actors can decide *within* existing sets of rules, or they can decide to change institutions.

Decision makers: We focus on early to mid-career journalists, academics, businesspeople, NGO workers, and state technocrats. Our 40-year time scale shifts focus from the present, which is inevitably politicized. By doing so, we **also hope to stimulate the interest and participation of senior decision makers, in an atmosphere that favors more creative and holistic thinking.**

Key decisions we aim to inform and influence: (1) We want to strengthen the discourse of integrated farming. Many actors influence this discourse including civil society farmers' networks, and the Office of Self-Sufficiency Economy. (2) We aim to contribute to debates around irrigation expansion in Northeast Thailand.

Wider regional significance

Most people in the Mekong region have rural or semi-rural livelihood strategies. Northeast Thailand's smallholder farmers are among the Mekong's more advantaged. Yet they often suffer from serious accumulated debt. Will they be forced to exit, resulting in land consolidation, or are more prosperous smallholder futures plausible? In what ways does Thailand's agrarian trajectory pre-figure the intensification trajectories of Lao or Cambodian lowland farmers?

Can farming systems be safeguarded from ineffective irrigation development? Can farmers do better, at lower intensities of resource use and impact? Northeast Thailand is one place to look for answers.

Approach and capacities

Methodology: Our general approach is to balance participation with technical rigor. Scenarios will be area-based *and* issue-based. We favor the method presented by Kowalski et al. (2009), which combines scenarios, modeling, and multi-criteria analysis in a participatory manner. We adapt this method to a farming-centered study as follows:

(Step 0) Outreach and participant recruitment.

(Step 1) The study mails participants written briefs about key driving variables, which are existing processes which have interacted to shape NE Thai farming, which, combined with emerging processes, will shape the future. Briefing about these drivers, their importance, and their trends is necessary to structure participant discussion.

According to Gomez-Limon 2009 et al. (2009) examples of key variables include, on the "supply" side: **development of agricultural techniques** (integrated farming, organic farming, new slow-release fertilizers, and GM-crops); **energy** (availability and cost of petrochemical inputs; opportunities for bio-energy production); **irrigation systems** (low vs. high effectiveness). "Demand side" drivers include **demography** (growth, aging, migration); **macroeconomic** situation (growth rate of economy; distribution of wealth); and **consumer preferences.** Public policy drivers include **trade liberalization; agriculture and rural development subsidies; energy policy.**

> Note: Many of these drivers are determined at levels higher than Northeast Thailand. We will explore national, regional, and global drivers. We cannot overstate the importance of higher-level energy drivers to local studies on long-range futures. Energy futures in the region therefore deserve scenario analysis as well (extending forecasting approaches such as IRM-AG 2008).

(Step 2) [Participant Workshop 1] Begins with oral briefing on drivers. After the briefing, the team guides participants to generate alternative stories (scenarios) about the future. Scenarios contain different plausible and logical combinations of supply drivers, demand drivers, and public policy drivers.

(Step 3) [Participant Workshop 2] Participants meet again, review the alternative scenarios, then proceed to review a list of criteria, suggested by the study team, that they can use to evaluate the scenarios (and later rank them in order of preference). Examples of criteria include: **prices** and **yields** of various agricultural crops and animal products; **input costs** (seeds, fertilizers, pesticides, energy, labor, management costs; water); public **subsidies; regulatory regimes** (restrictions on certain farming practices). Other criteria (quantitative or qualitative) might include: ease of market access; local employment; degree of land concentration; role of off-farm economy; social justice, and regional food and energy sufficiency.

(Step 4) Study team invites experts (by interview, survey, or commissioned study) to review the qualitative scenarios, and put **numerical bounds** on each criterion, scenario by scenario. For example, how much do farm incomes and sizes vary between a **baseline scenario**, an **open market** scenario, and a **local sustainability** scenario? The team creates a matrix which compares the qualitative scenarios according to the evaluation criteria. If necessary, modeling can be done to help complete this task (e.g., economic and land-use change simulations; see European Commission 2007: chapter 4). We prefer models with user-friendly interfaces, and welcome advice from Core Team on which models are most appropriate.

(Steps 5–6) [Participant Workshop 3] In Step 5, The team **presents the matrix** to participants for further dialogue. During this step, the study team asks participants (individually and/or as a group exercise) to **rank the relative importance** of each criterion.

(Step 6) The study team aggregates the individual or group rankings to derive an overall ranking of the scenarios, and communicates this ranking as an input for discussion during the following workshop.

(Step 7) Within one month, study team publishes draft proceedings, including the qualitative scenarios, evaluation matrix, and rankings.

(Step 8) Study team conducts telephone interviews with key participants to obtain their impression of the process as well as specific policy recommendations.

(Step 9) [Final workshop] If desired, a public event can be organized to close the project and allow actors to present policy recommendations to media.

(Step 10) Team publishes final report.

All workshops will be professionally facilitated. We will interview key informants and elites who might otherwise not participate consistently. **Most activities will be conducted in relevant field sites (*not* in urban conference rooms), with time budgeted for farm visits hosted by local farmers.**

Comment on vantage point: Our proposed methodology does not backcast (i.e., reason backward from a future desired state). Some actors may regard backcasting as more practical, because of the direct link to planning. However rigorous backcasting is enhanced by an approach which allows nuanced and objective treatment of uncertainty (forecasting). As the study progresses, those interested in developing robust long-range plans will be encouraged to do so, with support from the study team.

Existing data relevant to this proposed study (examples)

Subject domain	Provider / Title	Date	Duration	Resolution	Meta-Data / Other Link
Multiple (production, price, farmgate value, yield/ha, ...)	FAO / Various	2004	1996-2006	National	http://faostat.fao.org/site/357/default.aspx
Rural households' livelihood assets, income, expenditures, agricultural debts	Natl Statistics Office / General Census; Agricultural Census	2000 (Gen); 2003 (Ag)	1960 - present (every 10y)	Village	http://service.nso.go.th/stat std/report.html
Rural households' livelihood assets; development aspirations	Ubon Ratchathani Univ. / (see Ref. below)	2002	1990; 2001-02	65 villages, lower Mun basin: households' financial, physical, natural capital	

Not displayed above but relevant are various sources of data on energy (see IRM-AG 2008; Nguyen et al. 2007a;b).

Key publications relevant to proposed study

Bello, W., Cunningham, S., & Poh, L. K. (1998). *A Siamese Tragedy: Development and Disintegration in Modern Thailand*: White Lotus, Bangkok.

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Negotiating Flows in the Mekong

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Abstract

Negotiating water flows should be an essential part of river basin management in the Mekong region. If put into practice, the concept of environmental flows could prove useful for improving water-related decision-making. Environmental flows or E-flows are defined *as the water regime provided within a river, wetland or coastal zone to maintain ecosystems and their benefits where there are competing water uses*. Central to the E-flows concept is the recognition that ecosystems not only have their own intrinsic value, but also provide humans with essential services. Implementing E-flows requires establishing water flow regimes, which recognise ecosystem needs whilst trying to satisfy social and economic demands. It also requires the integration of a range of disciplines including engineering, law, ecology, economy, hydrology, political science and communication. In the Mekong region there have been a few experiments with E-flows as a tool for negotiating river basin management. The results from the existing case studies indicate that E-flows have the potential to significantly contribute to decision-making for improved water governance in the Mekong region. However, a basin-wide approach to E-flows is still lacking in the region, as is the involvement of multiple stakeholders and dissemination of vital data.

Introduction

Negotiating water flows should be an essential part of river basin management in the Mekong region. Implementing 'environmental flows' requires establishing water flow regimes, which recognise ecosystem needs whilst trying to satisfy social and economic demands. E-flows[i] are a vital tool to facilitate participatory negotiation and can lead to more informed decision-making on water resource issues within countries and across boundaries. As rivers resources become increasingly competitive, a multi-stakeholder approach to E-flows is advocated, requiring the integration of a range of disciplines including engineering, law, ecology, economics, hydrology, political science, environmental science, fisheries and communications into the equation.

While water resource management is typically a top-down, government-led process, E-flows brings together various stakeholders to determine an equitable way to share the river and leave enough to support the river's ecosystem. The time is right for applying E-flows to the Mekong region. The emphasis on promoting economic development has hitherto been the dominant paradigm. Implementing and negotiating E-flows can help to ensure that within this development trend there is also recognition of how that can impact the environment upon which much of the rural economy still directly depends.

Several E-flows pilot studies have been implemented in the Mekong region providing an opportunity to reflect on whether or not the E-flows concept can contribute to decision-making for improved water governance in the Mekong region. Different organisations such as the Mekong River Commission (MRC) and the International Union for the Conservation of Nature (IUCN) and partners have had rather different definitions and views on how to apply E-flows. Whilst the MRC's program objective was to 'apply the principle of E-flows and its concepts to determine appropriate water resources and development options and the maintenance of flows', the procedure approved by the MRC focused on using E-flows to determine minimum flows (MRC 2006). While IUCN's work aimed to use E-flows to determine appropriate flows as part of multi-stakeholder negotiations.

These different approaches, in some cases, have led to confusion over terminology and application in understanding how this tool could be applied and utilised in the Mekong region to address water allocation and governance issues.

In this chapter we reflect on the different terminology used for the environmental flows concept and its linkage to Integrated Water Resources Management (IWRM). We then look at how E-flows have been used in the Mekong region by sharing several cases. The E-flows concept has been introduced in the Mekong region through IUCN's book *FLOW* via the translating and building capacity on environmental flows in six languages and countries. The biggest achievement in terms of using the *FLOW* book has been to initiate a discussion of the linkages between hydrology, ecology, economy and society amongst some key regional stakeholders. Additional cases include an interdisciplinary multi-stakeholder approach used in the Nam Songkhram River Basin in Thailand, a rapid E-flows assessment carried out in the Huong River Basin and encouraging developments for adopting an E-flows policy and finally efforts to apply the E-flows concept and principles using an Integrated Basin Flow Management (IBFM) approach in the Lower Mekong River Basin.

Environmental Flows and Integrated Water Resources Management

As one of the least development and least degraded rivers, the Mekong's flow regime is essentially natural (King and Brown 2009). However, the region is faced with significant obstacles and challenges in implementing sustainable water resources management. With the overall population expected to continue to increase significantly, consumption trends rising with economic growth and more people likely to live in cities and towns by the year 2025 than ever before, freshwater ecosystems will be placed under continued pressure. This is due to water withdrawals for irrigated agriculture, the building of dams for hydropower to supply electricity, reservoirs to supply drinking water to large cities and navigational improvement projects to improve trade between countries. This may all be compounded by future climate change disruptions (WWF 2009).

> *Historically water has been managed from a supply perspective with an emphasis on maximizing short-term economic growth from the use of water. Little thought has been given to the health of resources itself and there is a poor understanding of the implications of overuse or declining river health. Water resource managers are now trying to come to terms with the need to take a more holistic view of the river system. They increasingly understand that one needs to take care of aquatic ecosystems and the resources they provide for long-term economic viability* (Dyson et al 2003; pp 15-16).

Central to a more holistic view of E-flows within a broader framework of IWRM is a process that promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (Global Water Partnership 2000). It is important to recognize E-flows as one of the tools of IWRM and as an important sector in its own right when looking at effective river basin management and planning. By identifying the environment as a sector it enables decision-makers to identify 'trade-offs' for water uses, such as water for irrigated agriculture, hydropower, drinking water or ecological purposes. At the same time, it should be recognized that the term 'trade-offs" may be problematic in the case of the Mekong Basin and emerging tensions between the hydropower and capture fishery sectors, where it is commonly used to imply a technical approach as opposed to the political dimensions of decision-making, while drawing attention away from considering development options towards focusing on impacts (Friend and Blake 2009). Similarly, the social dimensions of E-flows are just as important to recognize the societal benefits that water and its associated services provides. E-flows can be a powerful tool to contribute to water resources decision-making and negotiating water allocation outcomes.

During the last five decades, about 100 different approaches/methods have been described as environmental flows and more than 30 countries have begun to use such assessments in the management of water resources (Tharme 1996, King et al 2003, Arthington et al 1998). The concept and definition of E-flows varies nationally, regionally and globally. In many cases the concept of E-flows is not well understood and terminology used may differ markedly. For example, other terms used instead of E-flows include minimum flow[ii], instream flow[iii], ecological flow and environmental demand, and may have a different meaning to each individual (Moore 2004, Hirji and Davis 2009). Some would disagree whether these terms are even synonymous with E-flows.

The definition we use in this paper is, the water regime provided within a river, wetland or coastal zone to maintain ecosystems and their benefits where there are competing water uses (Dyson et al 2003). This has been further elaborated by the Brisbane Declaration[iv] as the goal of environmental flow management is to preserve socially valued freshwater ecosystem benefits and biodiversity". It calls on governments, development banks and water managers to take immediate action to recognise the benefits of environmental flows in water resources planning and implement the important lesson learned from efforts to implement environmental flow protection around the world. Implementation of environmental flow provisions as part of effective water governance is seen as integral (Riversymposium 2007).

Central to the e-flow concept is the recognition that ecosystems not only have their own intrinsic value, but also provide humans with essential services (Environmental Flows Network 2004). E-flows are important for freshwater dependent ecosystems in a river basin, as these ecosystems require a share of water to maintain their function. Freshwater ecosystems provide a wealth of food, medicine and fibre, water purification, aquatic organisms and wildlife habitat, tourism and recreational opportunities, shipping routes, employment, and opportunities for culture and spiritual renewable (Krchnak 2006).

Freshwater ecosystems are equally important to urban and rural communities. E-flows are therefore an important concept for strengthening the relationship between functioning healthy ecosystems and sustainable livelihoods for urban and rural communities. Ecosystems are not only a user of water in competition with other users, but the base from which socially-valued resources are derived and supported, and without which no sustainable uses are possible.

Water for Development and Ecosystems

An important aspect of E-flows is that it usually involves a compromise between 'water for development' and 'water for nature' (Environmental Flows Network 2006).

With the global population quadrupling in the past century, and much of this occurring within the Asia-Pacific Region, it is unavoidable that areas of irrigated agricultural land will continue to expand in some locations and water withdrawals from freshwater ecosystems will continue to increase (Richter et al 2006). Additionally, ongoing infrastructure development continues to compromise the health of freshwater ecosystems in myriad ways.

Failing to allocate enough water for the environment is likely to cause the ecosystems already stressed to deteriorate, thereby seriously affecting local livelihoods (IWMI 2005). It is important that the myth that water allocated to the environment is water unavailable for humans (Krchnak 2006) is dispelled. Further, it needs to be recognized that the maintenance or rehabilitation of river systems is linked to poverty issues. Thus the contribution of E-flows via river ecosystems to achieving poverty alleviation needs to be acknowledged (Environmental Flows Network 2006). It is therefore necessary to show how E-flows can be reconciled with sustainable livelihoods.

This will involve a shift in thinking, which in many cases is already occurring in the Mekong region. For example, Osborne (2007) discusses the rapid changes that are taking place in the international rivers of Southeast Asia, such as the Salween and Mekong Rivers, with evidence to suggest that there is a new shift in thinking, with environmental and social impacts of development no longer fringe issues in the sub-region.

The challenge now is to move beyond the water for development and water for nature debate and achieve a balance between these competing needs through using E-flows to negotiate water resources decision-making and ultimately improving the governance of water resources management in the Mekong region.

Integrating and Negotiating

There are a number of challenges and opportunities in implementing environmental flows. A challenge that applies to both developed and developing countries is the complexity of developing E-flows recommendations that are aligned with social goals, particularly in ways that involve all stakeholders in deciding upon the health of a country's rivers (Krchnak 2006). Diverse stakeholder groups therefore need to be meaningfully engaged in the development of an e-flow regime. E-flows advocates stress "putting E-flows into practice is not easy". It is emphasized that E-flows requires the integration of a range of disciplines from across the social, political and natural sciences, while adopting a learning process of negotiation between various stakeholders that bridge their different (and often competing interests) over water. Multi-stakeholder Platforms (MSPs) are an important part of the flows negotiations process. For example, Dore (2007) indicates that "Multi-stakeholder platforms are just one part of governance where actors with either a right, risk or general interest (stakeholder) are identified, and usually through representatives, invited and assisted to interact in a deliberative forum, aiming for all participants to learn, understand alternative perspectives, and possibly negotiate alternative strategies and agreements." It is recognized that there can be no single best method, approach or framework to determine an environmental flow. What works in one river basin, institutional or socio-cultural setting, may not necessarily work in another and so it is important to be aware of and attentive to lessons from other approaches.

Environmental Flows in the Mekong Region

There is evidence of a broad adoption of E-flows within an IWRM approach across the world, with developed countries leading the way and many developing countries with advanced interest (Moore 2004). Furthermore, Tharme and Smakhtin (2003) reported clear evidence of increasing research and practice in environmental flow assessments within a number of Asia's developed and developing countries including Indonesia, Japan, Korea, Nepal, Pakistan, Sri Lanka and Taiwan.

Many decisions in the Mekong region have to be made about flow management. E-flows provide a conceptual framework and information base to aid decision-makers. However, the E-flows concept is not yet widely understood or used in the region. It has the potential to be a useful tool to increase understanding and cooperation over water.

The countries in the Mekong region are at varying levels of E-flows understanding or implementation (see Table 1). Cambodia, China, Lao PDR, Thailand and Viet Nam have expressed interest or were in the early stages of undertaking environmental flow assessments (Tharme 2003).[v] In some cases, countries may have included E-flows in national legislation and policies such as in Vietnam. There has been no evidence of E-flows activity in Myanmar.

The contributing factors to adoption and implementation are complicated and may include political support due to strong community interest or pressure, a river basin that is critically degraded due to over-allocation or overdevelopment, and projects that are donor driven or instigated by a river basin organisation. E-flow adoption and implementation has been particularly strong where national legislation and policies placed E-flows as a priority within an IWRM framework and are also integrated into natural resource management plans at the catchment scale.

There is no evidence in the Mekong Region of E-flows being used as a subject or concept in negotiation around water related developments as is the case in some other parts of the Asia-Pacific Region. For example, negotiations occurred between the Kerala and Tamil Nadu governments in India over interstate river water sharing from the Mullaperiyar dam. In South Australia, negotiations are occurring between various stakeholders in the Murray-Darling Basin in the development of natural resource management plans, which incorporate E-flows.

Factors limiting the adoption of E-flows in the Mekong region include lack of awareness, resources, funds or political will. To be included in policies or regulations, some believe that there needs to be a strong agreement on the quantitative methods for E-flows. Others believe that the social dimensions are equally important and thus a balance is required. There is a limited level of capacity and ability to use E-flows as a negotiating tool among a diverse set of stakeholders. As some governments in the region believe they have more pressing water management issues that require immediate attention such as floods and droughts or river systems that are presently 'undeveloped'.

Table 1: Status of Environmental Flows Application in the Mekong Region

Cambodia	Participated in the MRC-led Integrated Basin Flow Management Study (IBFM) for the Mekong River Basin. E-flows have not been mainstreamed into river basin management, national legislation or policies.

China	The interest and use of E-flows in China has developed steadily (Tharme and Smakhtin 2003). E-flows are currently under experimentation within the Yellow River and Suzhou River with respective objectives for flushing sediment and water quality. Environmental Flows Assessments have been undertaken in the Zhangzi River. The Yellow River Conservancy Commission has been established and its regulation identifies that water allocation should include integrated management of domestic, agricultural, industrial, and environmental water use (see www.yrcc.gov.cn). There is also evidence of emerging research in hydrological engineering and aquatic ecology relevant to E-flows in China. However, there is no clear legislation or policies at a national level where E-flows have been explicitly recognized.
Lao PDR	Lao PDR was part of the IBFM Study for the Mekong River Basin undertaken by the MRC. E-flows have not been mainstreamed into river basin management, national legislation or policies at this stage. At the 1st National Waters Dialogue[vi] held in 2007, participants agreed that principles of E-flows should be included in the revision of the Law on Water and Water Resources.
Myanmar	No evidence of use of E-flows in the country.
Thailand	The use of E-flows is a relatively new tool in Thailand. The IBFM study for the Mekong River Basin includes Thailand and IUCN and partners piloted an E-flows study in the Nam Songkhram River Basin in 2007. There is a legislative and policy framework in which environmental considerations need to be considered for major development. However, constraints to the mainstream of E-flows in Thailand include the complexity of land and water use, institutional structures and social diversity, and availability of suitable methodologies, information and data.
Vietnam	The use of E-flows as a tool for IWRM is more advanced in Vietnam than in other countries in the Mekong Region. The Huong River is an example of where an E-flows assessment has been developed. Vietnam is also part of the IBFM study for the Mekong River Basin. *The Law on Water Resources* (1998) and the *National Water Resources Strategy: Towards the Year 2020* recognises that to protect aquatic ecosystems attention to ensuring E-flows, within a suite of other measures, is necessary.

In the past few years a series of mini multi-stakeholder processes took place in Cambodia, Lao PDR, Myanmar, Thailand and Vietnam seeking to understand and then translate the book 'FLOW: The essentials of environmental flows'.[vii] The book was unpacked, the concepts debated, and the book re-assembled in a local language translation by teams of government and non-government actors. This established a wider understanding of and constituency for environmental flows throughout the region. A different process took place in China, less participatory, but still resulting in a Chinese version of FLOW that was launched in Beijing by the Ministry of Water Resources.

National constituencies are necessary before there is any likelihood of successful acceptance of any transboundary 'environmental flows' process.

The Mekong River Basin is a place where environmental flows work has been experimented with on the mainstream, led by the Mekong River Commission (MRC), as part of their Integrated Basin Flow Management (IBFM) process. This work had many supporters – more outside MRC than inside – who wanted it to be successful and contribute to river development scenario debates. To be useful, the work must continue to focus on key areas of concern. For example, it is widely recognised that the Cambodian nation is heavily dependent on the productivity of the Tonle Sap Great Lake wild fishery which is threatened by ecological disruption to the natural 'flood pulse' system caused by water infrastructure development related changes to the wet and dry season flow regimes.

Clarifying the causes and extent of the threats, and then including that in basin development debates, is an important component of environmental flows work. In sub-basins of the Mekong, such as the Nam Songkhram River Basin – another flood pulse river system – in northeast Thailand, The International Union for the Conservation of Nature (IUCN) and partners also experimented with environmental flows processes with economic, ecological, social and transboundary dimensions.

Furthermore, catalysed by major floods in 1999, IUCN worked with other organisations, including provincial authorities and the International Water Management Institute (IWMI) to institutionalise environmental flows work in Vietnam. The Huong River Basin is a classic case of competing uses for water, competing views about whether a flood event is a disaster or a natural occurrence, and a range of views about what should be done. In short, it is just the kind of situation where an environmental flows approach can contribute.

Guttman (2006) referred to the need to "recognize the value of products and services provided by the river system" and that "the question of values is fundamental to identifying environmental flow requirements". Most would agree. But, how to establish these values? In many parts of the Mekong region there has been an urgent need to find a way for different perceptions of value to be expressed and heard in some type of deliberative process of exchange. At the transboundary level, recent efforts in the Mekong River Basin have included the Basin Development Planning (BDP) scenarios and a Strategic Environment Assessment (SEA) process. The BDP and SEA processes, and whatever comes after them, could do well to revisit participatory modes of 'environmental flows' as a useful approach to ensure water-related negotiations do not beholden to one or other sectoral or stakeholder set of interests.

The above mentioned examples are elaborated in this chapter to show the different experiments with E-flows piloting in the Mekong region and the challenges and opportunities for moving towards negotiating water-related decision-making.

Multi-stakeholder translations in the Mekong region – building capacity

Between 2005-2007 the IUCN and partners led a process of multi-stakeholder translations of the book *Flow: The Essentials of Environmental Flows* (Dyson et al 2003) into Burmese, Chinese, Khmer, Lao, Thai and Vietnamese. The English version of the book was unpacked, the concepts debated, and the book re-assembled in a local language translation of teams of government and non-government actors. This has established a wider understanding of and constituency for environmental flows throughout the Mekong region which was felt needed before any piloting of E-flows could take place.

The process and product were equally important. In practice, the process of translation unfolded differently in each country, but tried to stay true to the principles (see Box 1). Working papers were assembled to work with professional translators to prepare an appropriate translation of FLOW in each country. Each working group included people with different perspectives to ensure that the translation process included collective understanding and learning.

Box 1: Principles of the Translation Effort

State and non-State actors

Different disciplines

Different perspectives

Not privileging of any particular discipline or set

of actors

Take the time required to build a constituency

Deliberate choice not to just have one translator

but many contributors and peer reviewers

China was the least representative of deliberative democracy, but the non-State got heavily involved in the reviewing of the Ministry of Water Resources draft text and had a large impact on the final text. Cambodia, Vietnam and Laos were all very deliberative with State and non-State actors. The Burmese translation was undertaken by a high-quality civic organization and in Thailand; a small team of four persons led the work.

The product was then reviewed by experts from various backgrounds such as engineering, law, aquatic ecology, economics, hydrology, political science and geography. The strength of the process was that the working group and their peers became champions of environmental flows in their countries and also regionally.

Case of translating FLOW into Khmer

"The only way (for Cambodia) to achieve good water management and maintain environmental flows is cooperation and consultation among the ministries concerned". *His Excellency Sin Niny, Vice Chair of Cambodia National Mekong Committee*[viii]

Cambodians are well aware that alterations to natural flow regimes pose a large threat to existing use and production from rivers and lakes, such as the Great Lake or Tonle Sap. Negotiating flow regimes is recognised as being important. There is curiosity as to whether E-flows has anything particular to offer.

IUCN shared the FLOW book with key bilingual Cambodian partners in government and NGOs and sought their opinion on the potential utility of the book for Cambodia. There was enthusiastic support to proceed with an efficient process.

An IUCN colleague, who had also facilitated the translation of the World Commission on Dams (WCD) report, put his hand up to coordinate the process. He had learned a great deal from the WCD translation process and wanted to put his reflections from that process into action. A high quality translator who is very experienced in water and wetlands policy and practice was sought. With the facilitator and translator in place it was relatively easy to then build the Translation Working Group. The best people are always busy, and so it was agreed that the WG would meet on weekends – testament to the interest.

IUCN's support to multi-stakeholder water deliberations in Cambodia was a dual track. At about the same time IUCN began supporting the establishment and operation of multi-stakeholder Cambodia Water Group, facilitated by a very well respected NGO called CEDAC (Centre d'Etude et de Developpement Agricole Cambodgien/Centre for Study & Development in Agriculture). It was decided early on that this group with an agenda to foster deliberation about the most significant water issues confronting Cambodia, would not take on the quite specialized and onerous FLOW translation task. However, some of the Cambodia Water Group joined the translation team. And some of the translation team has subsequently become active in the Cambodia Water Group.

So the translators finished their task, but that group has morphed into the Cambodia Water Group, which is fostering debates, and convening dialogues, about substantive issues facing Cambodian people. So far their focus has been on irrigation development and the momentum for E-flows has not been as strong, despite all the translation efforts, as in other countries such as in Thailand where piloting took place in the Nam Songkhram River Basin.

A multi-disciplinary approach to environmental flows in the Nam Songkhram River Basin, Thailand

The Nam Songkhram is the second largest basin in Thailand's Northeast Region, known as *Isaan*, covering an area of 13,128 km^2. It is situated in the far northeast corner of Isaan in an area bounded to the south by the Phu Phan hill range with divides the Nam Songkhram River Basin from the Khorat Plateau and to the north and east by low sandstone hills beyond which lies the broad arch of the Mekong mainstream and Lao PDR beyond. The Nam Songkhram River is characterised over most of its course by gentle gradients and impressive meanders, with the last 250 kilometres or so flowing across a broad floodplain wetland landscape, just 140-160 meters above sea level. A defining feature of the Lower Songkhram River Basin (LSRB) is that it experiences a widespread flood across its floodplain each rainy season lasting between two to four months and its close eco-hydrological connections with the Mekong mainstream, not dissimilar to the Tonle Sap in Cambodia, albeit on a smaller scale.

An environmental flows assessment was carried out in the Nam Songkhram River Basin in 2006-07. This was the first time this approach had been explored in Thailand. It was developed based on the conviction that E-flows does not only consider the importance of river flows from a physical and ecological perspective, but also relates to the socio-political side of the equation. The role that people play both as beneficiaries of the wider riverine ecosystem and at the same time, modifiers of the ecosystem are key to understanding E-flows, "*flow is the key driver of the system" (*IUCN 2005). The interdisciplinary environmental flows work in the Nam Songkhram River Basin was a preliminary step towards providing data and practical tools for river basin and water managers at national, regional and local levels to apply similar approaches for better outcomes.

The E-flows approach combined two core elements:

1. A step-wise dialogue and consultation process with key actors and stakeholders within the basin and at a national level before and after the collection of empirical data;
2. An intermediate Environmental Flows Assessment exercise that collected field data across a range of disciplines at the height of the wet season flows and the lowest flow period of the dry season.

The overall emphasis of the study was to be placed on comprehending the ecological and social links on the floodplain wetlands. It was stressed that an appreciation of the "flood pulse" concept and key hydrological events such as the magnitude, duration, timing, frequency of flood and peak and low flow characteristics would be important, so they could be related to individual disciplines.

It was recognized that the concept of environmental flows was entirely new to the team and there were no local precedents to draw from. The basic methodology employed is described as follows:

- Collection of data from three representative sites in the Basin, using an intermediate E-flows assessment (IFA) approach (see Table 1), integrating the skills and the knowledge base of a range of specialists using an inter-disciplinary exercise. The field studies were timed to coincide with the two extremes of flow condition, i.e. peak flows in late August / early September 2006 and minimum flows in March 2007. This allowed first-hand visualization of flow variations in consecutive seasons and provided snapshots of the biophysical and socio-economic-cultural conditions pertaining at these critical times of the year. Eight days were spent on each seasonal assessment, with two days spent at each field site.
- Following the fieldwork in 2007, some possible future development scenarios were drawn up for the Nam Songkhram Basin. Based on the field findings and individual's 'expert opinions', the team reassembled in May to make broad predictive summaries about likely impacts on flow, ecosystems and livelihoods that might result from the implementation of each possible scenario. The outcomes were used to inform proceedings of a subsequent multi-stakeholder dialogue that brought together a wide

range of basin actors, including state sector representatives from the agencies with the task of developing water resources at the basin or provincial level and local community representatives.

This broad methodological approach emerged from an iterative process of negotiation and compromise between the parties involved that was considered appropriate to the local context. A key sub-goal of the research was to build individual capacity to understand the importance of E-flows while working in a multi-disciplinary team. Every effort was made for team members to work together and share insights. This approach, it is believed, helped to break down some of the barriers resulting from reductive research and fostered a better application of commonalities across the societal and natural science spheres. In this way, the research differed considerably from the approach taken by the MRC's IBFM project, where subject specialists spent proportionately little time working alongside each other in the field or as a combined team. Though the IBFM project was designed to be multidisciplinary by having experts exchange knowledge regarding hydrological and social livelihood changes based on response to certain agreed indicators, the discussions were largely at a technical level (based on the specialists field) not allowing for an interdisciplinary approach or a process of engagement with diverse stakeholders in the field.

Table 1: Levels of Environmental Flows Assessments (EFA) - implications

Method	**Resources**	**Time**	**Confidence**	**Resolution**	**Status**
Desktop – rapid	Low	2 days – 2 weeks	Low	Low	Planning Guide
Intermediate	Medium	~8 weeks	Medium	Medium	Preliminary EFA
Comprehensive	High	~32 weeks	Medium High	Medium/High	Full EFA

The Nam Songkhram River Basin E-flows study continually stressed the interdisciplinary linkages at the core of the process and underpinned the effort. It helped cement and broaden cross-disciplinary understanding amongst the team members and allowed them to more confidently talk about issues outside their core field of knowledge when communicating with interested observers, according to participants' feedback. Simply put, they began to appreciate the wider linkages between flow, ecosystem and livelihoods towards the end of the process, which were not immediately apparent from the start. An increased knowledge and understanding of the river floodplain system and how hydrological flows affect it, became a key output of the E-flows process. An unexpected output was the realization that there are several other analogous "flows" occurring on and around the floodplain, beyond the material water flows that were the primary object of the team's attention. These included the flow of natural resources on and off the floodplain; the flow of people in and out of communities or across borders; and the more symbolic flows of knowledge and power associated with water which it was felt by some team members are equally deserving of further attention in future flows studies.

Reflections on the E-flows study process as applied in the Nam Songkhram Basin

From the start, the E-flows study brought a wide range of actors to a single critical arena to discuss the linkages between flows, ecosystems and livelihoods on several occasions and challenged many of the long-standing beliefs and notions that exist, while opening up new modes of critical enquiry and thought.

Through the field study component, the E-flows study went a long way in demonstrating the benefits of not only multi-disciplinary studies, but cross or inter-disciplinary approaches. The team of specialists did not only go to the field to focus on their own disciplines, but actively engaged in sharing knowledge and experience about the floodplain ecosystem they studied between each member.

The field study was quite unique in that it managed to time the visits to the field so that the team was able to witness and survey the river floodplain at the flow peak and trough of the annual flood pulse phenomenon. The benefit of this timing for both visualization and empirical grounding in relationships between flows, ecosystems and livelihoods is hard to underestimate and has theoretical and practical implications for any future studies that adopt a similar approach.

Finally, it can be stated on a modest level that the study has proven itself to be a useful, economically efficient and participatory means to gaining insight into the social and natural processes at play in river basin and water management in a complex setting. As such, it is anticipated that the general approach and findings can provide useful lessons and pointers for future efforts to understand and influence environmental flows in Thai rivers.

General conclusions drawn from the field assessments

A strengthened understanding of the close relationship between the mainstream Mekong river and the Lower Nam Songkhram River Basin, in terms of ecology and hydrology, in particular the role of flooding arising from a notable backwater and occasional backflow effect on to the LSRB floodplain. Comparisons with the Tonle Sap (Great Lake) eco-hydrological processes would seem valid and worthy of further research.

Because of the primary influence of the Mekong mainstream on LSRB flood timing, duration and extent (as highlighted in WUP-FIN models), any attempt to control flooding by building flow control infrastructure on the Lower Nam Songkhram River or main tributaries like the Nam Oon, is likely to be futile and counterproductive, creating new and undesirable environmental impacts, which so far have not been taken into account in project proposals. This is evident from existing top-down attempts to build irrigation and flood control infrastructure on the mainstream, as at Ban Nong Gaa, Ban Dung District, Udon Thani and tributaries as on the Huay Sing at Ban Tha Bor or Huay Uan at Ban Uan, both in Sri Songkhram District of Nakhon Phanom.

The LSRB floodplain is in the advanced stages of an ecological transformation from being dominated by natural vegetation mosaics and diverse wetland habitats, to a more simplified ecosystem with fewer habitats and less biodiversity. This is principally as a result of removal of natural vegetation and conversion to agricultural land, in particular paddy fields and latterly, eucalyptus plantations. The ecological impacts of this transformation are not well studied, but abundant anecdotal and some empirical evidence collected during the study suggests that they are serious in terms of biodiversity loss and reduced aquatic productivity. The loss of ecosystem functions and services appear to be having serious negative impacts on fishery productivity and local livelihoods through food and income security declines, reflected in such phenomena as increasing labour migration out of the area, reversing an earlier trend of in-migration.

A rapid environmental flows assessment in the Huong River Basin, Vietnam

> *The People's Committee of Thua Thien Hue Province in central Vietnam wants to ensure responsible management of the Huong River Basin, which takes account of the health of the ecosystem and associated social and economic benefits. It is therefore supportive of the effort to learn about environmental flows, ultimately establish an environmental flow regime, and in so doing contribute to IWRM in the Huong River Basin* (IUCN 2005).

The E-flows approach was tested in central Vietnam's Huong River Basin (Thua Thien Hue Province) where flooding and saltwater intrusion have been major concerns. In 2003-2004, a multi-partner approach, including the Huong River Projects Management Board, the International Water Management Institute (IWMI), IUCN and local government agencies, identified the importance of developing an Integrated Water Resources Management (IWRM) strategy in the province to maintain ecosystem integrity while providing social, cultural and economic benefits to the local people. Such efforts were part of an informed approach to wise water usage.

Our quest for rapid economic growth must not blind us to the importance of protecting the flows our rivers need to stay healthy and productive.[ix]

Over two-thirds of the population of Thua Thien Hue Province lives within the Huong River Basin, all of whom rely directly or indirectly on the river resources for their livelihoods and well-being. The river system also provides vital functions for many of the riparian and aquatic ecosystems supporting the rich biodiversity found in the province. The Tam Giang-Cau Hai Lagoon is one of the largest river mouths of its kind in Asia and is an important asset to the local people. Flooding in the rainy season and saltwater intrusion in the dry season are major concerns in this area due to geographical and meteorological conditions (IUCN 2005).

In order to address the concerns in the Huong River Basin and determine a multi-faceted and integrated solution to competing water uses, a rapid environmental flow assessment (EFA) was initiated in collaboration with the Huong River Projects Management Board, IUCN and the International Water Management Institute (IWMI). The Huong River basin was chosen as a pilot project for Vietnam largely because, while its problems were complex, its politics were relatively simple: the entire river flows through only one province. Vietnamese officials now say they are convinced the E-flows concept will eventually help unite rival interests on other rivers. Although the notion of opening policy making to public consultation is still touchy in the one-party state, officials say that is bound to change, too.

Public participation is a process. It will take time, but it won't come at once. But be assured that we at the provincial government are creating an opportunity for the public to be included in the decision-making process, and the environmental flows process is one way to do this.[x]

A key objective of the work was to assist local water managers and users to undertake the principles and practice of environment flows, to institutionalize EFAs as a normal part of IWRM and to build local capacity of partners to undertake such work in order to improve water resources decision-making (IUCN 2005).

The methodology used in the Huong River Basin was quite different than that of the Nam Songkhram River Basin and significant learnings from the Huong case were incorporated into the Nam Songkhram work. The Huong River Basin case was a rapid assessment, which did not enable a truly interdisciplinary approach as was done in the Nam Songkhram. The results from the Huong River offered few insights from the biological and social sciences, as it was heavily focused on hydrological aspects. The main methodological focus of the Huong River was the EFA workshop, which was held in 2004 to open dialogue of perceived future impacts of dams on downstream ecosystems and communities. The focus of this workshop was strongly on identifying present river conditions including river classification and hydrological, ecological and social conditions of the river basin in general and of the assessment site in particular. It was the hydrological regime that was further elaborated, identifying and distinguishing between different key elements of the flow regime (such as timing of wet and dry months and size and frequency of flood events) and their importance to ecosystems. An alternative hydrological regime scenario was estimated. A number of indicators were agreed upon and a synthesis of expert opinions of all participants into a single ecology matrix was made to demonstrate the impact of the agreed upon flow scenario on the various indicators. The matrix was intended to provide a tool for decision-makers to weigh the various consequences of their management decisions (IUCN 2005).

Lessons learned from the Huong River environmental flows assessment include:

- Significant time and resources are required for implementation of an immediate or comprehensive e-flow assessment.
- Rapid e-flow assessment requires substantial reliance on expert judgment.
- Expertise from a wide range of fields is essential.

Recommendations included:

- Start with open discussions among all stakeholders
- Practical conditions at different regions/countries must be considered
- Due attention should be paid to single-province river basins of special value, such as the Huong River Basin (IUCN 2005).

Whilst valuable skills were obtained by the stakeholders involved in the rapid environmental flows assessment, more importantly a greater appreciation of the range of disciplines and perspectives required to inform infrastructure planning and flow negotiations was had. However there was still a general lack of understanding of the link between hydrology and ecology in environment flows assessment. This was deemed as one of the common limitations of rapid methodologies and also a function of limited data. It was also a challenge given this was the first time such an assessment had been carried out and the group tended to lean towards addressing the hydrological outcomes and once incorporating the broader ecological and societal needs it was felt that the hydrological results were sacrificed. Thus, a start to ‘negotiating’ the different disciplines was carried out but further steps are needed to truly utilize the E-flows framework to its greatest potential.

Environmental Flows and the Integrated Basin Flow Management Process in the Mekong River Basin

An additional level of complexity in water resource sharing and exploitation is added when dealing with large transboundary river systems, such as the Mekong River Basin. This case example is quite different than the others explored earlier in the chapter as it a regional case study as opposed to a 'country' study and has strong political aspects. This different context has significantly different implications as to what the results of the story tell us.

The MRC established a multi-disciplinary team to identify linkages between flow regimes that reflect the future options for water resources development in the Lower Mekong Basin (LMB), the status of natural resources and the local communities dependent on the river and its floodplain. Subject experts were selected from the four LMB countries, supplemented with international experts to develop capacity. A database on hydrological data of the Mekong River maintained by the MRC was being used to outline development scenarios and predict impacts, based on different flow regimes. The scenarios are expected to be used to inform and support public debate regarding impacts or changes to river resources and livelihoods, and support the decision-making process in the Basin.

According to Guttman (2006), "the practical experience around the world of applying environmental flows assessment have mainly been on smaller systems often highly regulated, with an aim to restore some functions or values which has been lost (or were diminishing rapidly). Applying flow assessment to larger systems has often focused on restoring a specific component, such as salmon fisheries. The application of a comprehensive and holistic assessment of a larger systems, which is still in relatively un-modified condition (such as the Mekong River) is unusual and in the context of Asia unique. Under the MRC's IBFM[xi] a particular approach, the Mekong Method, was under development based on the holistic approach in DRIFT[xii] (Downstream Response to Imposed Flow Transition)." The IBFM aimed to use the DRIFT approach to assess different scenarios based on biophysical and social-livelihood changes.

Integrated Basin Flow Management or IBFM is a set of multidisciplinary activities providing information and knowledge to decision makers on economic benefits and environmental and social impacts of development as related to changes in the flow regime. The IBFM initiative at the MRC started in 2005. It attempted to apply a holistic approach to flow assessment for supporting integrated river basin planning in the Lower Mekong Basin and facilitating the trade-off process with increased knowledge of economic benefits and impacts of water resource development. The IBFM initiative endeavored to strike the balance between development taking place in the Lower Mekong Basin and its associated impacts.

Ensuring the balance between water resources development and environmental protection remains the main challenge and it is central to the on-going debates of water resources development in the Lower Mekong Basin. Taking this goal as the point of departure for the IBFM study, the initiative was designed to support the decision-making process by providing high quality data, information and knowledge on the costs and benefits of water resources development.

Two directions were envisaged: 1) to support river basin planning by allowing different water resources development options to be assessed, and provide information on costs and benefits of that development and impacts; and 2) to contribute to the maintenance of flows on the mainstream of the Mekong (as laid out in the 1995 Mekong Agreement).

The IBFM Mekong Method developed by the MRC involved determining:

- The current hydrology of the river based on existing information such as historical flow data. This is to understand the Mekong flow season and its importance to the ecosystem and seasonal use of the Mekong resources for sustaining livelihoods;
- Historical parameters to describe the flow conditions of the river and its relationship with the flow change;
- Parameters to describe environmental and socio-economic benefits and impacts;
- Flow response relationships quantifying how possible future changes in hydrological parameters would probably be expected to cause changes in environmental and socio-economic parameters (King 2006).

The key IBFM activities included three components. The first was a one-year hydrological assessment of the Lower Mekong Basin culminating in the publication *Overview of the Hydrology of the Mekong Basin* (Mekong River Commission 2005). This provided the basis for further analysis of the flow into components and zones, which could be analysed separately with respect to flow changes (Guttman 2006).

The objective of the second component of IBFM was to *introduce an holistic, multidisciplinary approach to assess river flows from the perspective of beneficial uses (economic, social and environment) enabling discussion between the member-States on trade-offs and finally agreement on an acceptable flows regime (minimum flows) framework for basin development and flow monitoring.* This work resulted in the first basin-wide flow assessment giving an approximation of the environment, economic and societal benefits and costs of a number of possible future flow regimes (10-30 years). All of the flow regimes considered combinations of possible irrigation and hydroelectric power developments in the basin. Other combinations of possible development activities could and should be considered. This flow assessment involved a multidisciplinary team of specialists mainly formed of hydrologists, economists, ecologists, and modelers. Biophysical, economic and social assessments were produced (Guttman 2006).

The third IBFM component aimed to launch research designed to provide more detailed and confident prediction of costs and benefits of changing flow regimes and to initiate a broad stakeholder consultation of consequences of flow changes. The focus of this stage was the social assessment. The underlying focus was to find out the number of people living along the river and using its resources for subsistence. The first step was to describe their links with the river and to delineate the width and length of the river corridor within which they live (King et al 2003). The number of people were then quantified and their sources and use of water were traced and studied. The social and economic assessment studies were the first attempt to put values on the Mekong resources and valuate its importance in financial terms.

The term “trade-offs” has been used throughout the IBFM study however it is unclear whether this term is well understood. Which trade-offs is the MRC trying to pursue and which scale or form of trade-offs does the MRC aim to advocate. In the context of the IBFM, the trade-offs would be based on the knowledge of the three streams of assessment where the prediction of flow changes on ecosystem and people's livelihoods are factors into the trade-offs framework. A paper by Friend and Blake (2009) highlights the potential risks and contradictions resulting from an overly narrow focus by Mekong river basin and water resources planners on the notion of "trade-offs", especially with regards to the tensions between the hydropower and fishery sectors.

In comparison to say the Nam Songkhram E-flows case, IBFM Components 1-3 demonstrated the process of application of the DRIFT methodology. The three streams of study were undertaken: biophysical, social and economic assessments with an overall goal to provide knowledge on costs and benefits of water resources development in the LMB. However, a key component of using an environmental flows approach to negotiate outcomes is public participation, which was left out of the process. According to King and Brown (2009), negotiations to determine an agreed 'development space'[xiii] was not put into practice because the MRC IBFM project ended at the point of presentation of scenarios. However, stakeholder engagement was not implemented at any stage of the project, as was the case in the Nam Songkhram Basin. Furthermore, no publications resulting from the IBFM studies have been formally published and released in the public domain. IBFM Report 8, which documented the initial assessment of the three components, was initially released but then never formally published.

Was the IBFM process carried out (but not completed) by the MRC an environmental flows assessment? Has the data and information collected and analysed contributed to decision-making around large infrastructural development such as hydropower or irrigation schemes? During the Mekong Region Waters Dialogue in July 2006, participants concluded that "the outputs of IBFM would become inputs to political discussions, so it was essential that there was transparency in the methods and indicators used, and that the rationale for different flow regime scenarios was clearly explained. Engagement of local communities must also be encouraged, in terms of both carrying out IBFM activities and assessing the accuracy of the results. A regular mechanism for channeling information from the public should be built into the IBFM process (IUCN et al 2007). It is not believed that any of the data developed was carried out in a manner in which to achieve a negotiated environmental flow regime for the Lower Mekong Basin. The process has been partly successful in introducing the IBFM / DRIFT concepts to MRC staff and consultants but it could be challenged as to whether the methods employed have promoted a full understanding of the Mekong's resources and its multi-sectoral benefits. Is it clear from the IBFM initiative how the Mekong's resources will be impacted due to flow changes from dominant paradigm development initiatives in the region e.g. hydropower projects. A great deal of knowledge has already been carried out to understand flow changes by other organizations. Thus, how has the data collected under the IBFM complemented or added-value in the environmental flows discourse?

Global experience and guidance on E-flows requires integration of a range of disciplines and also negotiations between stakeholders to bridge different interests that compete for use of water. The reward is an improved management regime that guarantees the longevity of the ecosystem and finds the optimal balance between the various uses (Dyson et al 2003). There are several initial learnings from the IBFM process. Whilst the IBFM managed to undertake multidisciplinary research, which resulted in sharing and debating across the disciplines among the consultancy team and MRCS staff, there were no efforts to engage a wider stakeholder base and incorporate local knowledge into the process. Secondly, translating the scientific findings into language accessible for decision-makers such as through policy briefs was not carried out thus leaving decision-makers unclear about the complex dimensions of IBFM and its potential use in informing decisions about water allocation in the Mekong. Moving towards negotiating decisions would be a next step after data is collected, analyzed, and stakeholders are consulted and have opportunity to feed into the process. Part of the reason for not being able to move forward was the lack of agreement on the findings and certainly we might revisit the “trade-offs” terminology, which can be argued as not well understood, contentious or possibly poorly translatable in Mekong languages. The other reason was underlying political tensions with the IBFM case later became more apparent than with the other cases presented in this chapter. Until information is in the public domain, trust is only built through public discussion of complex and sensitive issues, and it is unlikely that techno-scientific and policy initiated studies will be able to contribute to informed decision-making.

The IBFM work ground to a standstill and different initiatives have moved forward in taking the limelight such as the Strategic Environmental Assessment (SEA) of the Mekong Mainstream and the finalization of scenarios under the Basin Development Program. Whilst these initiatives have made significantly improved efforts to involve stakeholders (where the IBFM process patently failed) it is still unclear as to whether the results will determine and commit the region to a negotiated flow regime, based on knowledge generated by the IBFM.

Conclusions

In the Mekong region there are various conceptions of environmental flows in the research community and among policy makers and practitioners. The examples presented in this chapter make the case that environmental flows is a useful tool for negotiating appropriate water regimes among multi-stakeholders. However, the question still remains as to whether implementing environmental flows in the Mekong region is an ‘impossible dream’ (IUCN, 2005). There are clear differences between countries in the Mekong Region in terms of approach and understanding of E-flows. E-flows piloting in the Nam Songkhram River Basin in Thailand was applied at an intermediate level to ascertain appropriate water regimes in the river and identify stakeholder groups based on a multi-disciplinary team of experts formed from academic, local government and community representatives. The case showed the difficulty in linking E-flows theory and practice but had strong emphasis on stakeholder engagement and dialogues as a contributing tool for piloting of E-flows. In the case of Vietnam, a rapid E-flows assessment was carried out in the Huong River Basin among diverse stakeholders however the assessment was not multi-disciplinary in nature and thus had difficulty in linking the hydrological and ecological aspects. Today, Vietnam can be seen as having moved the farthest in terms of government policy by incorporating environmental flows into policy at the national level. Some of the key government officials involved in the Huong River Basin study and the translation into Vietnamese can be seen as champions nationally of this approach and more work will be required to sustain these efforts.

Many observers do not believe that the Integrated Basin Flow Management approach utilized by the Mekong River Commission was a genuine environmental flows assessment, as the knowledge produced in the IBFM process was not shared and stakeholders were not engaged. Negotiation base on information generated could thus not take place. However the work exemplified the need for a wide range of data to inform decisions on balancing economic and social benefits of development with environmental and social costs. Procedures developed for environmental flows at the MRC focus on 'minimum flows' but does not go further in addressing a more holistic approach to environmental flows or using it as a tool for negotiating water regimes. A serious perceived weakness was the reluctance of MRC to publish its findings from the IBFM studies. The SEA and BDP now take over and could continue the process of determining an appropriate and negotiated flow regime for the Mekong that balances ecosystems and livelihood needs.

These cases exemplify the need to ensure that E-flows becomes an integral part of river basin management not only as an abstract concept in legislation that may be vulnerable to different interpretations and thereby impossible to become effective in law enforcement but as a process that involves multiple stakeholders dialoguing to determine the best possible flow regime for the Mekong region. As the multi-stakeholder translation process of the book FLOW showed, capacity building and equally importantly, finding the correct translated terms for complex scientific concepts is a crucial element to enabling people to participate effectively in a environmental flows process. In short, for E-flows processes to be adopted in the region needs a sustained process of support and trust-building between numerous interested actors and institutions to build a critical mass of expertise and understanding during the period of conceptual internalization.

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[i] There are many different methodologies, depending on the chosen emphasis. For a recent review see Tharme (2003).

[ii] *Minimum flows are used to describe the retention of enough flow to maintain river connectivity, especially for fish passage, but this is usually only one component of the flow regime that needs to be maintained, and there are few instances where an environmental flow consists of just a minimum flow* (Hirji and Davis 2009).

[iii] *Instream flows imply the flows needed to maintain ecosystem services from flows within the river channel, but this excludes the often important floodplain flows that overtop the channel* (Hirji and Davis 2009).

[iv] The Brisbane Declaration presents principles and a global action agenda that responds to the most urgent needs to protect rivers globally. It calls for action that strongly encourages the governments, development banks and water managers to take immediate action to recognize the benefits of environmental flows in water resources planning and implement the important lessons learnt from efforts to implement environmental flow protection around the world. Implementation of environmental flow provisions as part of effective water governance is seen as integral (Riversymposium 2007).

[v] For the four Lower Mekong countries, Cambodia, Lao PDR, Thailand and Vietnam, their assessments have been largely linked to the IBFM process of the MRC. China has moved further ahead through piloting E-flows assessments in various river basins and Vietnam has piloted a rapid E-flows assessment in the Huong River Basin and incorporated minimum flows into their national strategy.

[vi] In 2007, IUCN and partners organised a National Dialogue with the Government of Lao PDR and other stakeholders to discuss key water-related governance concepts including environmental flows.

[vii] Dyson et al (2003)

[viii] Quote in IUCN press release on Khmer Launch of FLOW (IUCN 2007)

[ix] Quote by Dr Nguyen Thai Lai, MONRE, Vietnam, 2005

[x] Quote by Nguyen Ngoc Thien, vice chairman the Hue Provincial People's Committee in 2007 to IUCN.

[xi] In 2006, The MRC Council approved the *Procedures for the Maintenance of Flows on the Mainstream*. The agreement includes: Specifically, except in the cases of historically severe droughts and/or floods, the Procedures apply to the cooperation in the maintenance of flows on the mainstream at selected stations: a) of not less than the acceptable minimum monthly natural flow during each month of the dry season under Article 6A; b) to enable the acceptable natural reverse flow of the Tonle Sap to take place during the wet season under Article 6B; and c) to prevent average daily peak flows greater than what naturally occur on the average during the flood season attributed to intentional water releases from manmade activities and other facilities under Article 6C. The flows to be maintained at specified locations as stipulated in a-c above are set out in a separate document entitled "Technical Guidelines" to be adopted/established by the MRC Joint Committee (MRC 2006). The authors are not aware of the development of these Technical Guidelines.

[xii] The Mekong Method aimed to incorporates useful aspects of environmental flows assessment as well as more conventional hydrological studies. DRIFT is a scenario-based framework, providing decision-makers with a number of options of future flow regimes for a river of concern, together with the consequences for the condition of the river (Dyson et al, 2003, p. 36).

[xiii] *Development Space* is defined by present day conditions and the negotiated limit of ecosystem degradation as basin development proceeds (King and Brown 2009).

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Strategic Environmental Assessment (SEA) and Cumulative Impact Assessment (CIA)

Marko Keskinen and Matti Kummu

Table of contents

I. Abstract

The Mekong River Basin is facing rapid changes, including intensive plans for water resources development. While the different water-related projects are considered important for economic development of the riparian countries, the negative impacts that they are likely to cause for ecosystems and livelihoods are estimated to be remarkable. Assessing the likely impacts of such development at different geographical and temporal scales is therefore crucial for successful planning and decision-making. Yet, existing impact assessment (IA) processes seem in many cases to be inadequate to capture even the actual magnitude of the impacts at different levels and scales. They are also predominantly expert-driven processes with a macro-scale view, leading easily to the neglect of local knowledge and contexts. Due to their technical nature, the assessments are also easily described in language that excludes most of the people from the discussion of their methods and results.

It has been argued that impact assessment in such a dynamic and complex setting as the Mekong River Basin requires better coordination between assessments at different levels, and overall, more adaptive approach that makes

better use of assessments from local level up to the regional level (see e.g. Keskinen 2008). Impact assessment also requires the recognition of highly political nature of water resources development and related planning processes, including the decisions on the ways the IA approaches are used. The impact assessments should therefore not be only responsive, but also address the more strategic, policy-level issues related to water resources development. At the same time impact assessments form only one part of the planning and decision-making processes, and they should therefore be studied in the broader context which they are being used.

This tool review looks at two major impact assessment methods, namely the Strategic Environment Assessment (SEA) and Cumulative Impact Assessment (CIA), and discusses their current use and future potential in the Mekong Region. Out of these two approaches, the SEA is a more strategic assessment approach that aims to anticipate the environmental impacts of planned development already in early phase –and at higher level– of planning and decision making. CIA, on the other hand, aims to evaluate the cumulative impacts of multiple different activities. While CIA can be used to support SEA, its use is usually more common on later stages of planning when many of the decisions about the focus and form of the development have already been made.

Several IA frameworks and methodologies providing possibilities to look at impacts at different levels and phases already exist in the Mekong Region (see e.g. MWBP and IUCN 2005; Lazarus et al. 2006; MRCS/IBFM 2006; Swift 2006; MRCS/WUP-FIN 2007; ADB 2008; Bezuijen, Timmins, and Seng 2008; TKK and SEA START RC 2009). However, the use of different IA methods has so far been rather non-systematic, with weak linkages between different assessments. Also misunderstandings related to impact assessment methodology and terminology are common.

Neither the SEA nor the CIA has –yet– been extensively used in the Mekong. They have, however, already for long appeared in the plans and strategies of both regional organisations and the governments of the riparian countries, and increasing amount of actors are including SEA and CIA as part of their planning process. Yet, the implementation of both of the methods seems still to be sporadic and weakly connected to the actual decision-making. The importance of understanding the possibilities and limitations of the two methods is therefore just increasing.

The tool review seeks therefore to answer particularly to the following two questions:

What are the general definitions of SEA and CIA, and what are the differences between the two (plus between them and other IA methods)?

In which ways the two IA methods have been used in the Mekong, and what can be learnt from the recent SEA and CIA work undertaken in the region?

II. SEA & CIA – An introduction

The impact assessments are generally carried out to inform planning and decision-making about the potential consequences of certain decisions and plans. Indeed, environmental decision-making is relying already so much on technical expertise and assessments that Rayner (2003) has characterized the present era as the 'age of assessment'. Consequently, there nowadays exists a wide set of different approaches, methods and tools for environmental, social and economic impact assessment in global, regional, national as well as local scales. It is important to realise that different approaches aiming to assess the impacts of different developments are by no means limited to SEA and CIA only, but plethora of other approaches do exist. Ironically, this has lead to situations where many IA methods are being developed and proposed but actually very few applied and used. This has very much been the case for example with the different impact assessment processes within the Mekong River Commission (MRC).

Due to large variety of different IA tools and approaches, one gets easily lost in the diverse possibilities provided by different, partly overlapping impact assessment tools. Even the agencies implementing the IAs are sometimes using wrong terms, talking of CIA when actually doing EIA, for example. Different impact assessment methods and approaches include Environmental Impact Assessment (EIA), Cumulative Impact Assessment (CIA or CEA), Social Impact Assessment (SIA), Strategic Environmental Assessment (SEA), Integrated Assessment (IA), Hydrological Impact Assessment (HIA), and Vulnerability Assessment (VA). A short summary of different impact assessment tools and their definitions is provided in Table 1.

This tool review focuses on two impact assessment methods that are commonly among the less well-known approaches among the different IA methods. Overall, it can be said that out of the two approaches, SEA is more strategic and CIA more responsive. While SEA looks at the environmental contexts and constraints related to planning and decision making at earlier phases and higher levels, the CIA aims to look at the cumulative impacts of development that is usually at least partly planned already. To be truly effective, however, both of the methods should naturally be applied prior the implementation of the planned projects.

Table 1. General definitions of different impact assessment (IA) tools and methods.

IA Tool		Definition
EIA	Environmental Impact Assessment	International Association for Impact Assessment (IAIA 1999) defines the EIA as follows: *"The process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made."* The major dilemma across the world is what does 'the environment' in EIA mean? It is also important to note that for most writers environmental impacts don't mean only environment, but more broadly "biogeophysical, socio-economic and cultural" effects (Vanclay 2004). In other words, EIA is closely connected to so-called triple bottom line approach emphasising environmental, social and economic aspects (*ibid*).
EA	Environmental Assessment	To overcome to confusion between the different environmental impact assessment methods, the different methods and approaches as sometimes referred jointly as Environmental Assessment (EA). For example (ERM 2002a) defines EA to be a systematic process to examine, evaluate and document potential impacts of proposed developments so that they can be taken into consideration during the decision making process, and uses the term as a collective term for project-level Environmental Impact Assessment (EIA), programme, policy and plan-level Strategic Environmental Assessment (SEA) and for the assessment of cumulative impacts (Cumulative Impact Assessment CIA)
CEA	Cumulative Effect Assessment	See CIA [1]
CIA	Cumulative Impact Assessment	Cumulative effects are the net result of environmental impact from a number of projects and activities (Sadler 1996). By definition, they are combined within a time and space framework established through direct and indirect activity effect relationships (*ibid*), and often in combination with the impacts of other past, existing and proposed actions. Each increment from each action may not be noticeable but cumulative impacts may become apparent when all increments are considered together. Consequently, CIA can be defined as *"a systematic procedure for identifying and evaluating the significance of effects from multiple activities. The analysis of the causes, pathways and consequences of these impacts is an essential part of the process"* (Cooper 2004: p.4).
SIA	Social Impact Assessment	In general terms, SIA is analysing, monitoring and managing the social consequences of development (IAIA 2003). SIA includes the processes of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions. Its primary purpose is to bring about a more sustainable and equitable biophysical and human environment (*ibid*).

[1] Both names, Cumulative Effect Assessment and Cumulative Impact Assessment are used when cumulative impacts are assessed. Throughout this document term CIA is being used.

IA Tool		Definition
SEA	Strategic Environmental Assessment	SEA is usually defined as a process of anticipating and addressing the potential environmental consequences of proposed initiatives at higher levels of decision-making, and evaluating the interlinkages with economic and social considerations (Sadler 1995; OECD/DAC 2006). Thus, SEA aims at integrating environmental considerations into the earliest phase of policy, plan or programme (P/P/P) development, on a par with economic and social considerations. By doing this, SEA aims to mitigate negative implications and maximize potential positive synergies (World Bank 2006). SEA can consist of family of different approaches using variety of tools and making use of participatory process (OECD 2006).
Int. A	Integrated Assessment	Int. A[2] is commonly defined as: a structured process of dealing with complex issues, using knowledge from various scientific disciplines and/or stakeholders, such that integrated insights are made available to decision makers (Rotmans 1998: 155) Int. A has evolved rapidly over the last decade as a new scientific concept to address the need for more multi- and cross-disciplinary approaches. Rotmans (1998) note the increasing recognition for the field of Integrated Assessment, but at the same time recognises that the methodological basis is lagging behind the expectations from the outside world. Parker et al. (2002) provide an interesting review on the state of Int. A modelling, concluding that the science behind the modelling is often not new and in many ways it can be considered to be the combining of old areas of science and research to consider problems in new, more holistic ways
HIA	Hydrological Impact Assessment	Out of the different IA approaches presented here, the HIA is the only one focusing specifically on water. HIA is defined as the *prediction or estimation of the consequences of a current or proposed human action on hydrology, sediment transport and hydrodynamics (Kummu 2008)*. The impacts on global climate, such as increased evaporation into the atmosphere due to irrigated fields or greenhouse gas emissions from the reservoirs, are not considered in this work to be part of the HIA analysis. The HIA could be classified as a CIA or EIA conducted in the fields of hydrology, sediment transport and hydrodynamics.

[2] Also acronym IA is used for Integrated Assessment, but as we use it to refer impact assessment more generally, we apply here Int. A as an acronym for Integrated Assessment.

IA Tool		Definition
VA	Vulnerability Assessment	Vulnerability can be defined in various ways depending on the field of application. One of the generally used definitions in relation to natural resources/environmental risks describes vulnerability as "the risk of adverse outcomes to receptors or exposure units (human groups, ecosystem, and communities) in the face of relevant changes in climate, other environmental variables and social conditions" (Clark and et al. 2000). Consequently, vulnerability assessment (VA) can be conducted in several scales and levels. According to Clark et al. (2000). VA, in contrast to EIA, selects a particular group, unit of concern or geographical area (e.g. landless farmers, boreal forest ecosystems, coastal communities, delta area) and seeks to determine the risk of specific adverse outcomes for that unit in the face of a variety of stresses. Further VA identifies a range of factors that may reduce response capacity and adaptation ability of the unit to stressors.

II.1 Strategic Environmental Assessment (SEA)

Strategic Environmental Assessment (SEA) has emerged during the last decade as a response to conventional environmental impact assessment approaches' inability to tackle increasingly complex environmental issues, including their integration with economic and social issues (Partidário 2004). By doing this, SEA aims to mitigate negative implications and maximize potential positive synergies (World Bank 2006). Thus, the SEA has been described as an approach for mainstreaming and 'upstreaming' environmental sustainability in the decision-making hierarchy, trying to address the issue of environmental sustainability as early as possible in the decision-making process (OECD 2006).

> STRATEGY?
>
> A concept used first in military science, strategy generally refers to the study and planning of means to achieve certain policy objectives.
>
> In planning and policy making, strategic approaches are not intended to find out what can happen in the future, but instead they aim to plan actions that make up possible routes to a desirable future (Mintzberg 1994; Partidário 2007).

There are differing definitions for SEA, but SEA is commonly defined as a process of anticipating and addressing the potential environmental consequences of proposed initiatives at higher levels of decision-making as well as and evaluating the interlinkages with economic and social considerations (Sadler 1995; OECD/DAC 2006). It has also been defined as a process that integrates environmental and sustainability questions through visions, intentions and strategic proposals, with the final objective of improving the decisions (Partidário 2007). SEA therefore aims at integrating environmental considerations into the earliest phase of policy, plan or programme (P/P/P) development, on a par with economic and social considerations. It is thus, as the name says, more strategic than most other impact assessments – it has even been said that SEA is a strategic facilitator of sustainability process (Partidário 2007).

SEA thus encompasses assessment of both policy initiatives and actual plans that have physical and spatial dimensions. SEA can consist of family of different approaches using variety of tools, rather than a single, fixed and prescriptive approach (OECD 2006). A good SEA should therefore be adapted and tailor-made to each context it is applied, with strong participatory nature. As highlighted by (OECD/DAC 2006), SEA is a continuous, iterative and adaptive process focused on strengthening institutions and governance, and by no means a separate system or a simple linear, technical approach. In the context of the Mekong, however, for example the MRC seems to consider SEA more as a decision-aiding tool rather than as an actual decision-making process (MRCS (2005).

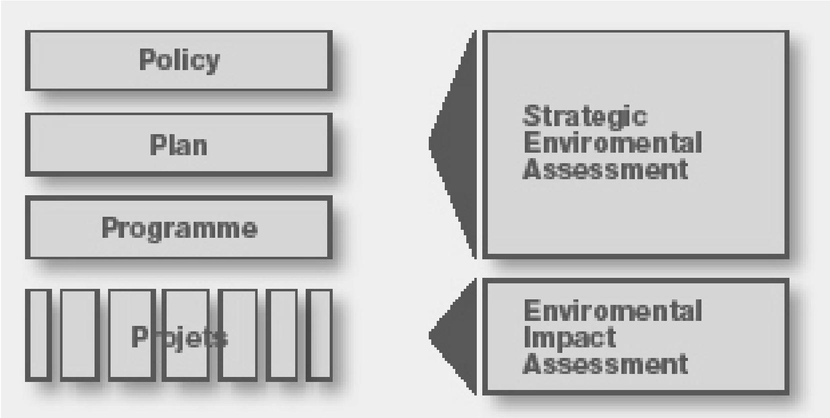

Figure 1. The relation of SEA and EIA in terms with the development of policies, plans, programmes and projects (OECD 2006).

It is important to notice that SEA has basically the same purpose and concept as Environmental Impact Assessment (EIA): they both seek to identify potential environmental –and in their broader sense, also social and economic– impacts as well as to recommend the ways to prevent or keep impacts to acceptable levels. The most remarkable difference between the two is the phase that they are applied: SEA is applied to programmes, plans and policies i.e. at more strategic and earlier stage of the decision-making process than EIA (Figure 1). Consequently, it is sometimes said that while EIA addresses the effect of development on the environment, SEA addresses the effect of the environment on development (MRC/BDP 2003). SEA thus follows similar steps than EIA, but has much larger boundaries in terms of time, space and subject coverage. SEAs can therefore also be seen to serve as an umbrella level of analysis that feeds more specific EIAs and improves their quality (ICEM 2009a). Table 2 below summarises some of the main differences between the two approaches.

Table 2. Some comparisons between EIA and SEA (Partidário 2007).

SEA	EIA
The perspective is strategic and long-term	The perspective is of execution in the short and medium-term
The process is cyclical and continuous	The process is discrete, motivated by concrete intervention proposals
The purpose is to help build a desirable future, rather than an attempt to know the future	The project to be assessed has to be known at relatively detailed level
The definition of what is intended is vague, there is a large amount of uncertainty and the data are always quite insufficient	The definition of what intends to be done is relatively precise and data are reasonably available or can be collected through fieldwork
Follow-up in SEA is performed through the preparation and development of policies, plans, programmes and projects	Follow-up in EIA is performed through the construction and implementation of the project
The strategy may never be put into practice given that the actions established in plans and programmes may never be implemented	Projects requiring an EIA are executed (or not), once their environmental feasibility is guaranteed

Internationally, the key milestones for the development and adaptation of SEA include:

European Union's Directive 2001/42/EC on SEA that entered into force in June 2001 in all EU Member States (European Union 2001)

Protocol on SEA to United Nations Economic Convention on Europe (UNECE) Convention on EIA in Transboundary Context, adopted in Kiev in May 2003 (UNECE 2003)

OECD/DAC Good Practice Guidance of SEA in development cooperation, endorsed by key donor agencies and International Financial Institutions (OECD/DAC 2006)

While the EU Directive naturally guides the actions of EU Member States only, the UNECE Protocol on SEA –that supplements the Convention on Environmental Impact Assessment (EIA) in a Transboundary Context– is open to all members of the United Nations. The UNECE protocol could thus be adopted also by the Mekong countries, and would actually be very relevant in the region due to its transboundary nature. The protocol has not, however, yet entered force as it needs still to be ratified by at least 16 UNECE Member states (for the latest status of the Protocol, see http://www.unece.org/env/sea).

The UNECE Protocol, once in force, will require its parties to evaluate the environmental consequences of their official draft plans and programmes in the transboundary settings. In addition, the Protocol addresses policies and legislation, although the application of SEA to these is not mandatory. The Protocol also calls for extensive public participation in government decision-making. The public will not only have the right to know about plans and programmes, but also the right to comment, have their comments taken into account, and be told of the final decision and why it was taken. This kind of participation of the public in strategic decision-making builds on the Convention on Environmental Impact Assessment in a Transboundary Context (so-called Espoo Convention), and the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (so-called Aarhus Convention).

The OECD/DAC Guidance on SEA puts a special emphasis on the value and importance of SEA in development cooperation, and seeks to provide broad guiding frameworks and principles in the operationalising SEA in practice (OECD 2006). For this reason, the guidance is particularly relevant in the Mekong Region. The OECD/DAC emphasises that applying SEA to development cooperation has benefits for both decision-making procedures and development outcomes, as it can (OECD 2006):

- provide the environmental evidence to support more informed decision-making,
- identify new opportunities by encouraging a systematic and thorough examination of development options,
- prevent costly mistakes, by alerting decision-makers to potentially unsustainable development options at an early stage in the decision-making process,
- build stakeholder engagement in decision-making for improved governance,
- safeguard environmental assets for sustainable development with poverty reduction,
- facilitate transboundary co-operation around shared environmental resources and contribute to conflict prevention.

As a practical example on the different contexts where SEA can be applied, (OECD/DAC 2006) identifies twelve key entry points for SEA at three broad settings[3]:

- SEAs led by Partner Country Governments:
- Macro-level strategies and plans
- Policy reforms and budget support programmes
- National sectoral development programmes
- Infrastructure investments programmes and plans

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[3] It is important to note, however, that due to the focus of the OECD/DAC, the recommendations seem to (over-)emphasise the role for donor agencies in implementing the SEA.

- Spatial development programmes and plans
- Transnational planning
- SEAs undertaken in relation to Donor Agencies' own processes:
- Country assistance strategies and plans
- Donors' partnership agreements with other agencies
- Donors' sector-specific policies
- Donor-backed public private infrastructure programmes
- SEAs in other, related circumstances:
- Independent review commissions
- Major private sector-led projects and plans

II.2 Cumulative Impact Assessment (CIA) [4]

Cumulative effects are the net result of environmental impact from a number of projects and activities (Sadler 1996). By definition, they are combined within a time and space framework established through direct and indirect activity effect relationships (*ibid*), and often in combination with the impacts of other past, existing and proposed actions. Each increment from each action may not be noticeable but cumulative impacts may become apparent when all increments are considered together.

Consequently, CIA can be defined as "a systematic procedure for identifying and evaluating the significance of effects from multiple activities. The analysis of the causes, pathways and consequences of these impacts is an essential part of the process" (Cooper 2004: 4). CIA is, according to Hegmann et al. (1999: 3), "environmental assessment as it should always have been: an EIA done well".

Although no universally accepted framework for CIA exists, general principles have gained acceptance. These eight principles of CIA (Table 3) have been presented by Council on Environmental Quality (1997: 8). Each of these principles illustrates a property of cumulative effects analysis that differentiates it from traditional environmental impact assessment (*ibid*). The principles can be used to facilitate the CIA process planning, implementation and evaluation.

Table 3. Principles of CIA (Adapted from Council on Environmental Quality 1997: 8).

	Principle
1	Cumulative impacts are caused by the aggregate of past, present, and reasonably foreseeable future actions.
2	Cumulative impacts are the total effect, including both direct and indirect impacts, on a given resource, ecosystem, and human community of all actions taken, no matter who (federal, non-federal, or private) has taken the actions.
3	Cumulative impacts need to be analyzed in terms of the specific resource, ecosystem, and human community being affected.
4	It is not practical to analyse the cumulative impacts of multiple actions on the universe; the list of environmental effects must focus on those that are truly meaningful.
5	Cumulative impacts on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.
6	Cumulative impacts may result from the accumulation of similar effects or the reinforcing gross interaction of different impacts.

[4] CIA can also be called Cumulative Effect Assessment (CEA).

7	Cumulative impacts may last for many years beyond the life of the action that caused the impacts.
8	Each affected resource, ecosystem, and human community must be analyzed in terms of its capacity to accommodate additional effects, based on its own time and space parameters.

If EIA assesses the effects of a project to identify and mitigate its key effects, and SEA is the same thing for strategic actions, then CIA cuts in the opposite direction. Instead of focusing on the effects of a given action it focuses on the receiving environment and considers all of the effects on a given receptor (Therivel and Ross 2007) (Figure 2).

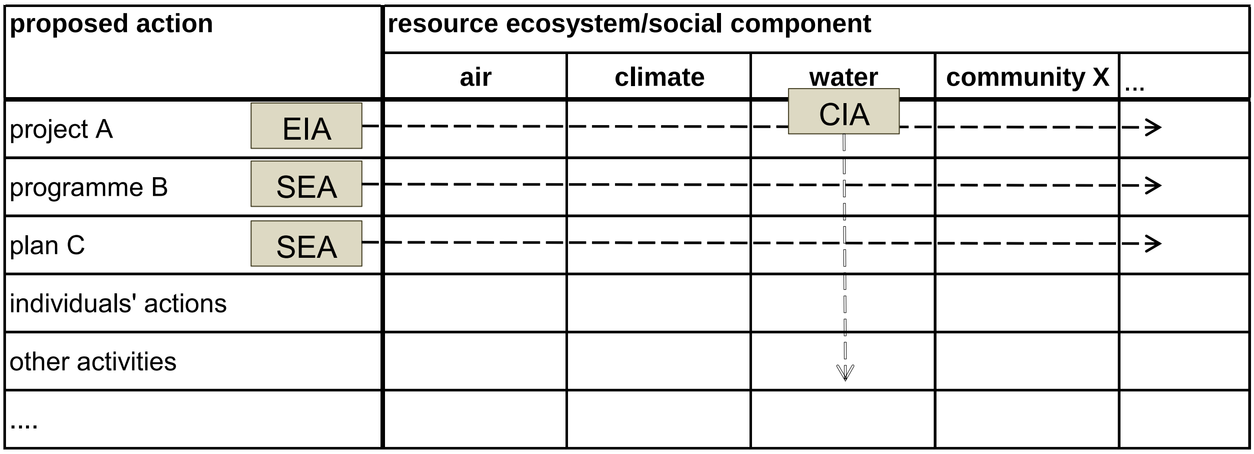

Figure 2. Example of actions and resources assessed by EIA, SEA and CIA (modified from Therivel and Ross 2007: 366)

Identifying past, present and future actions is critical to establishing the appropriate geographic and time boundaries for the CIA (Council on Environmental Quality 1997). One particular project might not have very significant impact alone but cumulative impact of the active projects might exceed the significance threshold (see Figure 3).

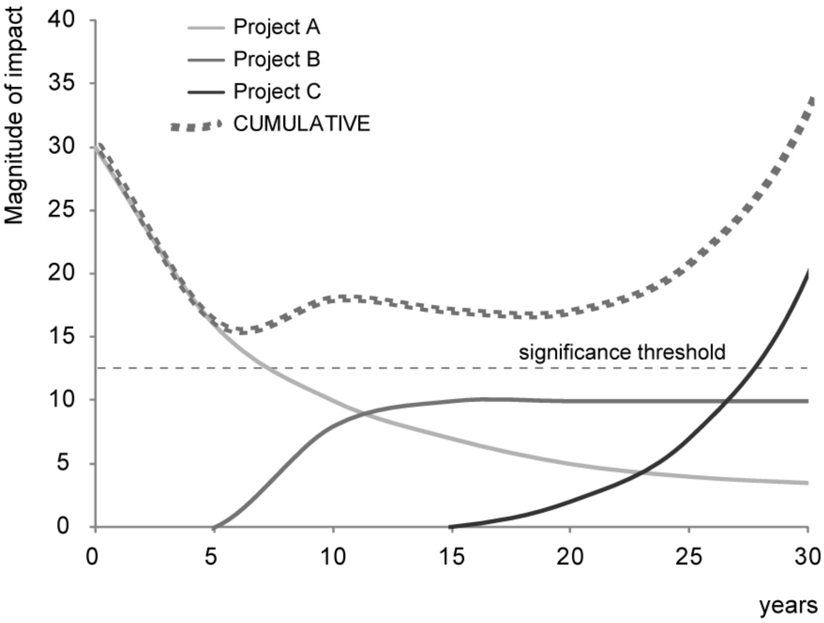

Figure 3. Time frames for project-specific and cumulative impact analyses (Applied from Council on Environmental Quality 1997: 17). Note*: the possible*

reinforcing gross interactions of the cumulative effects are not considered in this illustration.

As are the temporal scales critical for the CIA process, so are the spatial scales. The CIA can be done at different spatial scales ranging from local to basin level. Further, CIA can be done either sectorally (e.g. only for climate – as shown in Figure 2) or multi-sectorally where the key sectors (e.g. water, climate, ecosystem, socio-economic, fisheries, etc) are selected to be covered by the CIA. The sectors and spatial scales to be included depend very much of the objectives of each particular CIA.

The CIA process itself can be divided into three main phases, applying the division proposed by MacDonald (2000: 302) for cumulative effect assessment: a) scoping phase; b) analysis phase; and c) management and implication phase. Each of the phases has been further divided into interrelated steps. This kind of conceptual process provides an 'idealised' framework for the CIA process and should be taken as indicative only. Further, one should keep in mind that each case is different and the steps of the process are, at the end, case specific. Therefore, a case tailored CIA is always recommended.

Scale issues are present in various interrelated steps of the CIA process. The spatio-temporal scales follow through the whole process and should be included in most of the interrelated steps. The scales should be recognised as an integral part of any IA process and taken into account from the beginning of the assessment process.

Scales are particularly important when identifying the critical processes and areas of possible consequences, selecting the spatio-temporal scales of the assessment, identifying the data needed and available, selecting the methodologies and tools related to the process, and presenting the results of the assessment to the decision-makers and planners (Kummu 2008). Therefore, scale might serve as a tool for providing a common framework for the multi-disciplinary IA process (*ibid*).

III. History of use and significance in the Mekong Region

The on-going and planned water development projects in the Mekong Basin are likely to cause remarkable changes for the availability of these water-related resources, and consequently for the livelihoods of millions of people (World Bank 2004b; IUCN et al. 2007a; MRCS/WUP-FIN 2007). Different assessments and analyses have therefore been undertaken by actors at different levels to guide planning and decision-making. Yet, the current assessments provide differing estimates on potential environmental, social and economic impacts. Particularly basin-wide assessments have several challenges related to their comprehensiveness and overall reliability (see e.g. IUCN et al. 2007a; Mirumachi and Nakyama 2007; MRCS/WUP-FIN 2007; Wyatt and Baird 2007; Kummu and Sarkkula 2008). Current assessments are also predominantly responsive, looking at the impacts of planned (or even already on-going) developments in the basin, while the more strategic assessments about the possible development paths and options –e.g. in form of Comprehensive Options Assessment (World Commission of Dams 2000) or Strategic Environmental Assessment– are basically non-existing.

It is, however, exactly these more strategic assessments that would be needed to consider the most sustainable options for development in the basin. Although the basin resources are already utilised in a variety of ways particularly through small-scale farming and fishing and diverse use of wetland resources (Mekong River Commission 2003; MRCS/WUP-FIN 2007), the common justification for water resources development is the "underdevelopment" and "underutilisation" of the basin and its resources (World Bank 2004b). Consequently, most development plans focus on sectors such as irrigated agriculture and hydropower, while a majority of the population in the basin actually depends on livelihoods more directly dependent on natural resources such as fish. Worryingly, these kinds of large-scale development interventions seem –despite their ultimate objectives on poverty reduction– in many cases actually to undermine the foundations of the livelihoods of the poorest groups by impacting negatively the availability of and access to common pool resources, most importantly fish (Phillips et al. 2006; MRCS/WUP-FIN 2007).

The challenges related to impact assessment and, overall, to water development can be linked to the broader challenges with water governance in the Mekong Basin. In terms of governance, the planning and decision-making processes in practically all riparian countries remain relatively non-participatory and non-transparent, hindering open discussion about the different development plans and their potential impacts. Due to the crosscutting nature of water, water management also falls under several different ministries and institutes; both vertical and horizontal discontinuities and even institutional rivalries follow, making water governance particularly challenging to coordinate (Hirsch et al. 2006; Sokhem and Sunada 2006; Keskinen et al. 2007).

III.1 Impact assessment within the Mekong River Commission

The Mekong River Commission (MRC) is arguably the most suitable organisation for basin-wide impact assessment in the Mekong River Basin. The Commission does not, however, have a common impact assessment approach that would be applied systematically in the Commission and its national committees. Instead, the different MRC programs have planned –and sometimes even implemented– several assessment methods over the years, often with relatively poor coordination between the programs. More recently, the MRC has been increasingly involved in both the SEA and the CIA, particularly in relation to the planned mainstream dams in the Mekong (Carew-Reid 2009; ICEM 2009a, 2009b, 2009c, 2009d, 2009e).

Within the MRC's Basin Development Plan (BDP), assessment methods proposed during the past years have included Environmental Assessment system, so-called Project Screening Toolkit as well as the Social Impact Assessment process that makes use of the Social Development approach (MRCS/BDP 2005; MRCS/WUP-FIN 2007). Assessment methods proposed within the Environment Programme, on the other hand, include Social Impact Monitoring (SIM) and Vulnerability Assessment (VA) systems that are currently being implemented through a combined SIM/VA assessment. In addition, the EP published already in 2002 thorough plans for implementing EIA and SEA in its activities in the Mekong Basin (ERM 2002a, 2002b), but these plans were never put into action. An additional assessment project –now halted– within the EP (and partly within the WUP) was the Integrated Basin Flow Management (IBFM) process that was one of the broader assessment approaches within the MRC (MRCS/IBFM 2006; MRC/WUP-FIN 2007).

At the moment, the BDP is undertaking a rather extensive cumulative assessment of environmental, social and economic impacts of planned water development in the basin. The assessment is based on the modelling of flow changes for different water development scenarios. The first, initial results from the modelling were presented in the MRC Hydropower Programme's Regional Multi-stakeholder Consultation on September 2008. The modelling looks at six possible scenarios under three situations: 1) Baseline, 2) Definite Future and 3) Future Plan in the LMB, concluding that in the foreseeable future (next 20 years), the main flow changes in the Mekong mainstream will be caused by hydropower development in the Upper Mekong Basin. The modelling results were indicating only relatively small changes in the water flows, particularly in more long-term when the impacts of increased irrigation are expected to offset the impacts of hydropower dams (MRC 2008).

In addition, in spring 2009 the MRC launched a 14-month Strategic Environmental Assessment (SEA) process of the mainstream Mekong dams under consideration (MRC 2009). It will be the first SEA implemented within the MRC, and its reports are expected by the end of 2010: the set of inception reports were published at the end of 2009 (ICEM 2009a, 2009b, 2009c, 2009d, 2009e). The exact nature of the assessment is, however, still unclear, and it can even be asked whether the assessment really is SEA or actually closer to CIA (see e.g. Phonekeo 2009).

Common to most of the different IA approaches applied so far within the MRC is that they have been planned in a relatively top-down manner and that they make predominantly use of aggregated, macro-scale data. Many of the assessments also focus narrowly to (pre-)selected issues only, instead of more comprehensive and cross-sectoral approach. Despite these challenges, the assessment results provided by the different MRC programmes are used to guide planning and decision-making on water development in the basin. For example the World Bank used the results generated by the MRC's Decision Support Framework –and only by that– to formulate its Mekong Regional Water Resources Assistance Strategy, concluding that *"there is scope for significant levels of co-ordinated development"* in the basin (World Bank 2004b). Such a statement has been challenged by other actors and assessments, and it is also bolder than the conclusion given by the modellers themselves (Phillips et al. 2006; IUCN et al. 2007b; Middleton 2007; Käkönen and Hirsch 2009).

III.2 SEA at the Mekong

The Mekong Region doesn't –yet– have too many examples of the actual implementation of Strategic Environmental Assessment (SEA) in the water sector. There are, however, increasing number of plans for the SEAs both at regional and national level, with some SEA processes already implemented and others in the process of being implemented. There are naturally good reasons for this, as the numerous plans for water resources development in the basin have currently weak or even non-existing assessment of potential alternatives at more strategic and earlier levels of planning[5]. The construction of the hydropower dams in the Mekong Basin –particularly the mainstream dams in the Lower Mekong Basin– is also seen as the single most important strategic decision for the four MRC member counties since the signing of the Mekong Agreement in 1995 (Soussan 2009). Related to this, the recent ADB-MRC-WWF report looking at the environmental criteria for hydropower development in the region concluded that there are clear advantages in initiating environmental assessment early in the planning process (King, Bird, and Haas 2007). Even more importantly, this view was shared by the MRC Member States at the regional consultation meeting on the MRC Initiative on Sustainable Hydropower in September 2008 (Soussan 2009). Such views are –together with pressure from development banks and donors– likely to increase remarkably the implementation of SEA in the region.

SEA at riparian countries

Out of the different Mekong countries, Vietnam and China are the most advanced in terms of the actual implementation of SEA in the water field. In Vietnam, SEA is already required by law: the Law on Environmental Protection of 2005 introduced the concept and defined specific requirement for SEA (Tu 2009). The law also identifies six areas where SEA should be applied for strategies and plans,

[5] Some would, however, argue that it is already too late for the proper SEA in the region, as many of the more strategic decisions regarding for example the modes of energy production in the riparian countries have already been largely done.

including integrated river basin planning processes at inter-provincial level (Tu 2009). The SEA is, however, still a new tool, and awareness, understanding and capacity in its use is therefore at the early stages of development (ICEM 2008). In addition, the resistance for adopting the SEA in planning processes remains high, and as a result the influence of SEA on actual planning practices is still modest (Tu 2009). In the water sector, first pilot studies regarding the strategic environmental assessment for sustainable hydropower development in Vietnam have, already been done, and reports related to these processes published (ADB 2009a; Soussan et al. 2009).

Also China has already adopted the SEA into its legislation; it was included into the law on Environmental Impact Assessment in 2002. The law defines two types of SEA documents that should be prepared for two different plans, the regional plan and special plan (Gao and Xu 2009). Consequently, the SEA has been used already in number of fields ranging from river basin plans to transportation, with over 30 SEAs conducted at national level and more than 100 at local government level (Carew-Reid 2009).

In other Mekong countries, the implementation of SEA is less systematic. In Thailand, SEA is considered as a “key historical initiative”, as it is expected to decrease the conflict between the people and the governmental sectors as well as to help developers to invest in sustainable way (Paranan 2009). Consequently, in 2005 the National Environment Board appointed a sub-committee to consider and carry out SEA, and the SEA Guidelines were approved in 2009. SEA is, however, yet to be incorporated into the Enhancement and Conservation of National Environmental Quality Act (ADB 2009b; Paranan 2009).

In Cambodia, Lao PDR and Myanmar, the SEA has not yet been really adopted at national level. The countries have, however, already been involved in some regional SEA initiatives. and SEA is in one way or another apparent in government plans and policies, particularly those related to EIA (ADB 2009b; Kyaw 2009; Salichanh 2009). The GMS Program also has plans to implement SEA in Lao PDR related to its plans to construct mainstream dams into the Mekong (ADB 2009b).

A set of powerpoint presentations representing a good summary of the status of the SEA implementation in different Mekong countries (at the time) can be found from the GMS Program’s Power Trade webpage at:

http://www.gms-powertrade.net/dsp_page.cfm?view=page&select=4

SEA at regional level

The two most important regional actors currently promoting SEA are the MRC and the Greater Mekong Subregion (GMS) Program. In addition, the World Bank has been involved in SEAs particularly in Vietnam. The MRC started in spring 2009 a 14-month Strategic Environmental Assessment (SEA) process of the planned mainstream Mekong dams, with outcomes expected in late 2010 (MRC 2009). The study is done by the International Centre for Environmental Management (ICEM), and it seeks to identify the potential opportunities and risks as well as the contribution of hydropower to regional development (Carew-Reid 2009; ICEM 2009a, 2009b, 2009c, 2009d, 2009e). A special emphasis in the assessment is put to the stakeholder involvement[6].

The GMS Program is conducting SEAs in the Mekong Region through two interlinked processes: as part of its regional power trade initiative as well as through its Core Environment Program (ADB 2009b; Carew-Reid 2009; GMS-EOC

[6] As highlighted in the MRC’s website: “There will be many opportunities for various stakeholders to engage with and provide inputs to the SEA. The team conducting the assessment will engage with NGOs, civil society and community representatives” (MRC 2009)

2009).The GMS Program's SEAs focus on variety of issues ranging from tourism to energy, including also water-related assessments (ADB 2009b; GMS-EOC 2009).

In addition, other planning and impact assessment processes in the region have had similar kinds of strategic implications, although they have not necessarily been named explicitly as Strategic Environmental Assessments. For example, the Hydropower Strategic Impact Assessment of Laos, prepared by Norplan A/S for the World Bank (World Bank 2004a) and the study on Environmental Considerations for Sustainable Hydropower Development, published jointly by, ADB, MRC and WWF in 2007 (King, Bird, and Haas 2007) include strategic assessment processes that share similarities with the SEA.

III.3 CIA at the Mekong

With the increasing number of water development plans in both Mekong mainstream and its tributaries, the importance for the assessment of cumulative impacts of such plans is becoming more and more important. This need is also being recognised by both national and regional actors. For example the results of the consultations on hydropower development in the four MRC member countries (Soussan 2009) concluded that "Every person consulted was concerned about the cumulative effects of several dams along a relatively short stretch of river, with the eleven proposed schemes being clustered in two blocks. It was clearly stated that the present process of feasibility studies and impact assessment does not take account of these cumulative impacts, with each proposal being considered in isolation. This view was shared by the regulatory authorities consulted in the riparian countries (WREA in Lao PDR, MoNRE in Thailand)".

The CIA and related methods have been applied in the Mekong in various scales, ranging from tributary to basin wide assessment. Those have been made by various actors, such as ADB, WB, and MRC. Each of the CIA has been done for different purposes, with different tools and within various scales and levels[7]. The five cases of the CIA applied in the Mekong (listed below) have been selected to be analysed in this work (see Chapter IV.2):

Nam Thuon 2 (NT2) (ADB 2004)

Nam Ngum 3 (NN3) (ADB 2008)

World Bank (WB) funded work at MRC (World Bank 2004b)[8]

Basin Development Plan 2nd phase (BDP2) under Mekong River Commission (MRCS/BDP2 2009)

Adamson (2001) water balance study[9]

The Nam Thuon 2 CIA was the first published CIA done at the Mekong Basin and therefore significant step in water allocation assessment field. It was done as a part of NT2 hydropower project for both, tributary and basin scale. The NT2 CIA is multi-sectoral assessment covering a wide range of sectors from urban development to fisheries. Nam Ngum 3 is somewhat similar process to NT2, although done only for tributary scale.

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[7] *Scale*: The spatial, temporal, quantitative, or analytical dimensions used to measure and study a phenomenon

Level: The level refers in this work to the impact assessment sectors that are assessed within the domain of CIAs

[8] The World Bank CIA work refers here to the CIA work done at the MRC during the BDP phase 1 and partly during the IBFM project

[9] This water balance study is not really a CIA in its strict definition but referred as one in Kummu & Sarkkula (2008)

Two of the assessments, namely World Bank and BDP2, have been done under MRC. Their main focus has been to assess the basin-wide development impacts on hydrology and flooding. It is important to note that these two assessments were originally not called officially as CIAs as is the case with Adamson (2001). Their actual scope may thus have been a bit different than the one could expect from “real” CIAs.

There are two other related cases in the Mekong, namely Lao "optimisation study" for dams , and possible Thai CIA study. Those are not, however, analysed in more detail in this document as there was not enough information available of them at the moment of writing.

As listed above, there are few CIAs applied in the Mekong. Four of them include basin wide spatial scale (NN3 is done for sub-basin scale only) and the hydrology as an analysed sector is common to them all[10]. According to Kummu & Sarkkula (2008), however, there is urgent need for scientifically sound CIA in the Mekong. Despite of the existing studies (see above), there has not yet been done one that would be independent, transparent and coherent from all the aspects that are important in the assessment, such as tools, data, development scenarios, etc. Furthermore, it would largely benefit the overall understanding of the development impacts, should various CIA be done with using the same development scenarios and then compared with each other. That would give better understanding of the reliability of the range of impacts.

[10] NT2 and NN3 have also other sectors involved, see more in Chapter IV.2.

III.4 Applying CIA in the Mekong – case Tonle Sap

Development in the river and the basin will alter the flows and floods in the basin. This is also the conclusion of the CIAs that have been recently made for the Mekong Basin (Adamson 2001; ADB 2004; World Bank 2004b). These CIAs are concentrating sectorally on hydrology. The impact of climate change on the hydrology has not been included in the CIAs, but it is considered to have an important impact on the Mekong and Tonle Sap hydrology, especially during the latter part of the 21st century (Penny 2008).

Development impacts on the Tonle Sap

Each CIA analysis (Adamson 2001; ADB 2004; World Bank 2004b) made for the Mekong Basin, mainly for hydropower impact assessment, concludes that dry season water levels would rise and wet-season water levels would be lower than at present. The flow alterations would be more significant close to the dam and gradually decrease with distance in the lower Mekong Basin. The flow alterations in the Mekong main stem would directly impact the flood pulse of Tonle Sap Lake. This is because around 60% of the Tonle Sap flood water originates from the Mekong, and the water level in the lake is controlled by the water level in the Mekong mainstream (MRCS/WUP-FIN 2007).

Due to the considerable variety and ambiguity of different development plans, the prediction of cumulative impacts of ongoing and planned development is extremely challenging. For example, existing CIA studies focusing on flow changes have applied different approaches, and used different values, and therefore provide different estimates of the potential changes in flow. Three different CIA studies were analyzed and used for flow-alteration predictions:

CIA 1: The Mekong River Commission (MRC) has compiled a basinwide CIA under the Integrated Basin Flow Management (IBFM) project by using Decision Support Framework (DSF) modelling tools (World Bank 2004b).

CIA 2: The Asian Development Bank (ADB) conducted a basinwide CIA within the Nam Thuon 2 environmental impact assessment study (ADB 2004).

CIA 3: Adamson (2001) compiled analyses of the downstream hydrological impact of the Chinese cascade of dams

The focus of this case on the Tonle Sap system is for three reasons:

Tonle Sap ecosystem forms a particularly important economic, social and environmental resource for the entire Mekong Basin and for Cambodia in particular (see e.g. Bonheur 2001; Keskinen 2006; Lamberts 2006; MRCS/WUP-FIN 2007).

The Tonle Sap is due to its unusual flood pulse system and immense aquatic production most probably among the most vulnerable ones to major changes in water quantity and quality of the Mekong River (see e.g. Kummu and Sarkkula 2008; Lamberts and Koponen 2008).

The Tonle Sap system has been the main focus of the recent research activities of the authors, and presents therefore a relatively well-understood case for discussion on the potential impacts of Mekong development.

Scenario work carried out under WUP-FIN project, aiming to estimate the cumulative impact of the changing floodplain conditions in the Tonle Sap, focused on comparing the flow changes between Flow Regime FR3 (MRCS/IBFM 2006) and the baseline in 1997 and 1998 on a number of flood and water quality indicators of the lake and the floodplain. The comparison of the simulation results gave the following results:

the inundated floodplain habitat would be reduced by 7-16%

the period of inundation would be shortened by 1-2 weeks

the increased dry season water level would inundate permanently (extending the permanent lake) a major part of the flooded gallery forest around the lake dissolved oxygen conditions would worsen by extending strongly hypoxic in the floodplain during early flooding due to slowly rising flood

sediment and nutrient input to the lake with the flood waters would be reduced

A first estimate of the impact of the changing floodplain conditions was made by introducing a cumulative indicator for floodplain productivity potential by giving an estimate for the minimum and maximum value for each individual indicator. The calculation of the cumulative impact of the physical and water quality factors gave a value in the order of 25 % reduction in the floodplain productivity potential, even with rather conservative estimates for individual indicator changes. This estimate is well in line with the assessment made by the expert panel within the IBFM Phase 2, where it was estimated that Flow Regime 3 would result in an overall 20-30 % or more reduction in the productivity potential of the Tonle Sap Lake and its floodplain (MRCS/IBFM 2006).

What about the cumulative impacts on Tonle Sap Lake?

It is important to highlight that the impacts presented above provide only selected examples of some of the impacts that the water development in the basin is likely to cause. Keskinen et al. (2008) concludes that the actual overall impact to Mekong ecosystem will naturally be a combination of these different impacts, which also vary across different spatial and temporal scales. In the case of Tonle Sap, for example, it is yet very difficult to provide reliable estimates what would be the actual combined, cumulative impacts of different basin developments due to the complexity of the Tonle Sap system and lack of information on both planned development and the system functions.

Keskinen et al. (2008) provides a good example of the major challenge related to current basin-wide impact assessment practices in the Mekong; the problem of assessing the cumulative impacts of basin developments, in particular to the more complex systems such as the Tonle Sap – or overall e.g. the fisheries or floodplain dynamics of the Mekong (Keskinen 2008). Meaningful impact assessment of these kinds of crosscutting issues would require a holistic approach that integrates expertise from several different disciplines and makes use of several different disciplines – and impact assessments focusing on different themes. Yet most of the current impact assessments in the Mekong Basin have a relatively narrow, sectoral focus, and they thus tend to 'compartmentalise' the environment and social systems into selected indicators and sectors only (Lamberts 2006; Keskinen 2008).

Nevertheless, already the 'sectoral' examples of the estimated impacts indicate that the current plans for Mekong development are going to have considerable impacts on the river ecosystem, and consequently on livelihoods dependent on the river and the resources it provides (particularly when realising that the impact estimates presented herein are based on more conservative development scenarios than what the present day plans would require). Consequently, already the few examples presented herein are enough to justify a request for more open and better-informed discussion about the Mekong development and its impacts.

IV. Comparative assessment of the tools in multiple cases

IV.1 Comparative assessment of the SEAs

As the Strategic Environmental Assessments (SEAs) are only starting to be implemented in the Mekong Region, there is relatively little material for a proper analysis of past SEA exercises. What is clear, however, is that the implementation of SEAs at both national and regional levels will be a long process that requires plenty of capacity-building and resources. Capacity building on SEA methods and practices has also been one of the most important needs raised by the representatives of different ministries and institutes in the riparian countries (see e.g. ADB 2009b; Kyaw 2009; Tu 2009). This is also illustrated in the case of SEAs in both Vietnam and the MRC, where the assessments are led by external consultants. In addition, the riparian countries have very different institutional and legal capacities to embrace the SEA, and these need therefore to be considered in the implementation of SEA as well (World Bank 2006; ADB 2009b). On the other hand the data availability is not seen to present considerable problems for the implementation of the SEA, at least for the assessments done in relation to hydropower development (Soussan 2009).

The findings from the SEA on Vietnamese hydropower development indicate that SEA can be a useful tool in the analysis of the social and environmental implications of water resources development as well as in raising discussion about the alternatives for current plans related for example to hydropower development (ADB 2009a; Soussan et al. 2009). The assessment process and its several documents also provide a useful reference for further work on SEA in the region. At the same time the process in Vietnam also indicates the potential challenges related to SEA. The most important challenge is the fact that the outcomes of the assessment depend greatly on the indicators and alternative scenarios –and, overall, on the focus– used in the assessment. While the SEA focused on the assessment of hydropower development, it can be asked whether the actual, strategic objectives of the SEA would have been better served if the original focus of the SEA would have been broader, covering for example the entire energy sector and policies (of which hydropower and particularly individual hydropower projects are only one part).

The study on Vietnamese hydropower included also other limitations. The alternative scenarios for energy production in Vietnam, for example, included in the SEA focused only on thermal power, namely coal-fired thermal plants and combined cycle gas turbines (CCGT)[11]. Such a focus left more innovative modes of energy production –including increases in energy efficiency– outside the assessment, even when the SEA report itself concludes that the general efficiency of the energy sector is still low (Soussan et al. 2009). In a similar manner, the assessment of social impacts looked only at direct short-term impacts (most importantly resettlement), leaving more profound long-term impacts beyond the assessment (SEA Study Team 2008b; Soussan et al. 2009).

Similar findings apply for the on-going SEA of the Mekong mainstream dams, implemented by the Mekong River Commission (MRC 2009). The objective of the SEA was from the very beginning defined rather narrowly, namely look at the mainstream Mekong hydropower development strategies and their potential opportunities and risks as well as contribution to regional development (Soussan 2009; Phonekeo 2009). Nevertheless, the SEA has an important and ambitious aim to form several different scenarios based on different levels of dam construction, from none to all of the 11 proposed schemes. Such scenarios are also planned to include consideration of alternative sources of generation capacity

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[11] The SEA report gives the following reasons for the focus on coal and CCGT; This is in line with Power Development Plan VI where the main part of thermal power in the future, apart from nuclear, will come from these sources; Diesel and oil-fired thermal plants are not considered to be economically viable compared to other thermal energy sources; Nuclear power has not been considered as an alternative in this Study; Import of more hydropower from neighbouring countries is not considered as an option; Increase of renewable energy, including small hydropower, is not considered feasible and can anyhow only account for a small amount mainly for supply to non-grid areas; and Increase of pumped storage capacity is not considered an option as it is a net consumer of energy and needs to be in balance with nuclear power development in Viet Nam (Soussan et al. 2008). In addition, while the potential for energy efficiency and conservation was included in power demand forecast, it was considered difficult to estimate the potential due to data availability and reliability (SEA Study Team 2008a).

to replace the dams not included in each scenario, so that future energy demand can be met (Soussan 2009; Phonekeo 2009).

While having a strong strategic nature and aiming to impact the broader policies related to hydropower construction, the assessment publications also indicate that the assessment may actually not end up to be much more than ‘just’ a cumulative impact assessment of already planned dams. Such an impression is supported e.g. by Phonekeo (2009), who concludes that a the present process of feasibility studies and impact assessment does not account for cumulative impacts, there is a need for the MRC’s SEA to provide a clear, transparent evidence-based assessment of these potential cumulative impacts. Although the CIA can –and should– be an integral part of SEA, a real, strategic SEA should not be reduced only to that, but must also include an assessment of broader policies and plans that lead to the increased need for hydropower development. It remains to be seen whether the MRC’s SEA really fulfils also the latter, more strategic dimensions.

IV.2 Comparative assessment of the CIAs

The comparative assessment of the CIA studies has been made for the five assessments in the Mekong as listed above. The assessment is based on the tables where various characteristics of the CIAs are presented and discussed. Within the assessment, the CIAs are reflected through the questions presented in the PN67 protocol. It is important to note that many of the CIAs included in the table were originally not called officially as CIAs, and their actual scope may thus have been bit different than the one could expect from “real” CIAs.

Brief background and introduction together with the purpose of the CIA are given in Table 5. The tools used in each CIA are summarised in Table 6 together with the scenario settings of the assessments.

Table 4. Overview of the CIAs.

CIA	Background	Purpose
NT2	The Nam Theun 2 (NT2) Hydropower Project is the largest infrastructure development project in Lao People’s Democratic Republic (PDR). The CIA estimates the potential impacts the project may have on the development of the area. Source: (ADB 2004)	Aim was to analyse the combined impacts of a number of projects, either implemented together or in a sequence and of future developments and plans, in relation to NT2. Two development scenarios are presented based on a 5-year and 20-year planning horizon. The anticipated output from the CIA is a comprehensive understanding of the cumulative impacts of the NT2 Project in the regional context. Further, the cumulative impacts of basin wide development plans were assessed.
NN3	The work is part of ADB preparations for financing of the proposed Nam Ngum 3 Hydropower Project (NN3), located in the Nam Ngum River Basin (NNRB) in Vientiane Province, in central Lao PDR. Source: (ADB 2008)	The purpose was to estimate the cumulative impacts of the extensive hydropower development programme identified for the Nam Ngum Basin on various sectors. Three scenarios were assessed with two time horizons: 2013 and 2020.
WB	The World Bank CIA work refers here to the CIA work done at the MRC during the BDP phase 1 and partly during the IBFM project. The results of DSF assisted the above mentioned activities to determine the relative scale of changes that accompany possible future states of development. Source: (World Bank 2004b)	The DSF simulation results were aimed to assist the basin planning process to determine where the limits lie with respect to different concerns regarding changes in flows and subsequent impacts on environmental, social and economic parameters. Altogether six scenarios were simulated: 1. Baseline, 2. China Dam, 3. Low Development, 4. Embankments, 5. Agriculture, and 6. High development.

CIA	Background	Purpose
BDP2	The second phase of the BDP Programme (2006-2010) is designed to institutionalise the participatory planning process established during BDP Phase 1 and further develop the assessment tools and IWRM-based planning capacity to produce a rolling IWRM-based Basin Development Plan. The work is undergoing and the final results are not yet ready. Source: (MRCS/BDP2 2009)	Altogether three scenarios has been set-up and simulated by using the DSF: 1) Baseline, 2) Definite Future and 3) Future Plan in the LMB. The assessment has been made of changes in water flows, water levels, flooding and salinity intrusion. The work is continuation for the WB CIA presented above.
Adamson	The work compiled analyses of the downstream hydrological impact of the Chinese cascade of dams involving a reported 23 km^3 of active reservoir storage Source: (Adamson 2001)	The work aimed to estimate the impact of Chinese cascade of dams on the downstream hydrology by using simple water balance model. Two cases were simulated: 10% and 20% regulation.

Table 5. Summary of the tools and scenarios used.

CIA	Summary of the tools	Scenarios used
NT2	Two different tools have been used in the CIA for the hydrology and hydraulic part of the study: MikeBasin for the basin hydrology and MIKE11 for the floodplain modelling. Scenario simulations were carried out with MikeBasin, which is a water balance model for simulation of water allocation, reservoir operation, irrigation and other water uses. A one-dimensional river and floodplain model (MIKE11) was established for the Cambodian part of the Mekong, including the Mekong mainstream, Tonle Sap River and Great Lake, the Bassac River that runs in parallel with Mekong from Phnom Penh, and a simplified set-up of the Mekong Delta in Vietnam.	Two scenarios were used: 5-years scenario 20-years scenario Both of the scenarios included the following development sectors: hydropower, transport, irrigation, water supply and sanitation, urban development, fisheries, forestry, industry, mining, social development, conservation
NN3	Simple water balance calculations were done to estimate the hydrological impacts of the development activities. The hydrological model MORDOR was applied for the area but no documentation for the simulations was available at the time of preparation of the CIA report. The Parsifal river-simulation model was applied to simulate the hydropower regulation. The Parsifal model was not, however, operational when this report was prepared.	Three scenarios were used: Scenario 1: Present situation plus Nam Ngum 2 hydropower plant plus 61 000 ha of pumped irrigation, mainly in the Vientiane Plains (down-stream of all hydropower plants included in this study) Scenario 2: Scenario 1 plus Nam Ngum 3 hydropower plant Scenario 3: Scenario 2 plus Nam Ngum 5, Nam Lik 1 and 2, Nam Bak 1 and 2 as well as 39 000 additional ha of gravity-fed irrigation.

CIA	Summary of the tools	Scenarios used
WB	See above the BDP2 CIA – same DSF toolset has been used in this CIA.	Altogether six scenarios were used: Baseline: Representing the development conditions that existed in the basin in the year 2000. China Dams: baseline + two current and two largest proposed Chinese dams. Low Development: baseline + minimum level of development Embankments: Low Development scenario + 130,000 ha isolated from the Cambodian floodplain Agriculture: Low Development scenario + substantial growth in consumptive water usage in all the sectors but in hydropower High development: Agriculture Development scenario + substantial amount of hydropower growth.
BDP2	DSF consist of three different simulation models: SWAT, IQQM and iSIS. They are combined together as follows: A series of hydrological models, based on the SWAT software have been set up to simulate catchment runoff. The SWAT model was used to estimate inflows to the other simulation models. These hydrological models provide input of runoff to a basin simulation model that uses the IQQM software. A hydrodynamic model, based on ISIS software is used to simulate the river system downstream of Kratie to the South China Sea. It uses the IQQM results as a boundary condition in Kratie.	Includes six possible scenarios under three situations: Baseline: year 2000 Definite Future: baseline + existing and planned dams in Upper Mekong + existing and under-construction dams in LMB Future Plan in the LMB: definite future scenario + planned LMB dams (tributary + main streams) + planned LMB irrigation and water supply
Adamson	Simple water balance model was used in this CIA.	Two scenarios were used: 10% regulation 20% regulation

Common for all the selected CIAs is that they cover the hydrology sector. Three of the analysed assessments, namely WB, BDP2 and Adamson, are also limited to this. The other two (NT2 and NN3) are multi-sectoral analyses where hydrology has been only one part of the wider assessment (Table 7). Majority of the CIAs are basin-wide assessment while only NN3 covers smaller scale, namely Nam Ngum tributary. The others have, however, also sub-basin scale part in the analysis. The temporal scale varies, but most of the studies have various scales (Table 7).

Table 6. Scales of the CIA and sectors covered.

CIA	Scales	Sectors covered

CIA	Scales	Sectors covered
NT2	The CIA has five main impact zones (or spatial scales): Nakai Plateau Nakai Nam Theun NBCA Xe Bangfai basin and surrounding districts Nam Theun, Nam Kading and Nam Hinboun Basins and surrounding districts Mekong River Basin The temporal scales of the CIA are: 5 years scenario 20 years scenario	The following sectors are covered in the CIA: Hydrology Vulnerability to flooding Social issues Fisheries Water quality Transport Water supply and irrigation Urban development Institutional issues Biodiversity
NN3	Spatial scales: Impact zones: Upper Nam Ngum Mid Nam Ngum Nam Lik- Nam Xong Lower Nam Ngum Whole Nam Ngum basin Temporal scales: Year 2013 Year 2020	The following sectors are covered in the CIA: Engineering hydrology and hydropower production Greenhouse gas emissions from reservoir Water resources and water quality Land management and land use Irrigation Policy and planning Aquatic ecology Terrestrial ecology Mining Socio-economic and poverty issues Health issues
WB	Spatial scales: Sub-basin (LMB floodplains) Basin Temporal scale of the CIA is around 20 years.	The following sectors are covered within the CIA: Hydrology Flooding characteristics Salinity intrusion
BDP2	Spatial scales: Sub-basin (LMB floodplains) Basin Temporal scale of the CIA is 20 years.	The following sectors are covered within the CIA: Hydrology Flooding characteristics Salinity intrusion
Adamson	Spatial scales: Sub-basin (results are presented at various stations along the mainstream) Basin There is only one temporal scale in the analysis and that is the time when all the planned dams in the cascade are predicted to be in operation.	The CIA covers only the hydrology sector

The main results of the assessments are presented in Table 8 with the discussion on the importance of the results.

At this stage, structured cross-comparison of results from different CIAs is not feasible. Each assessment has been developed and used to answer different sets of questions, so direct comparison of results is difficult. Differences result not only from differences in the tools used, but also from a mix of other issues, including underlying assumptions, input data and the way research questions are posed.

Table 7. Main results of the CIAs and their potential importance.

CIA	Main results	Importance of the results
NT2	The results are presented for different scales for both temporal scales. The main results for the 20-years scenarios at the Mekong Basin scale are as follows: Dry season discharge at Savannakhet may increase by 135% while during floods, the discharges may be reduced by around 20% At Kratie the average annual maximum flow will be reduced 12% The water level will be reduced by about 60 cm during floods and increased by about 70 cm in the dry season at Phnom Penh The changes in flow pattern will have a significant negative impact on floodplain and Tonle Sap Lake fisheries as these are favoured by high wet season water levels The changes in flow pattern will, however, have a significant positive impact by damping damaging flood incidents and by the increased dry season water level that will support irrigation and reduce salt intrusion in Mekong Delta.	The NT2 CIA is probably the best achieved CIA study for the basin wide development impacts on hydrology. It is done transparently and it is well documented. The tools suite well for the purpose of the study. The results are also well presented in each scale and scenario. The study shows well the importance of assessing the cumulative impacts. The NT2 dam has a significant local impact but rather marginal impact at the basin scale on hydrology. At the same time, the cumulative impact of all the planned development in the scenarios will have remarkable impact on the hydrology and flood pulse characteristics.
NN3	The CIA results are for the local and tributary scale only and therefore, while looking at the basin scale results this CIA is not relevant. Nevertheless, the results are relevant at the scales of the assessment.	The spatial scale of the study is rather narrow covering only the Nam Ngum basin. Therefore, the results are important in tributary scale but when looking at the basin scale, the results are not that usable. Moreover, the methods used in the CIA were not completely reported and therefore, the results might not be very reliable.

CIA	Main results	Importance of the results
WB	The report concludes that the current development of the Mekong river is very limited and the natural flow pattern is essentially intact, as are the highly productive natural fisheries in the river. The ongoing and planned developments in the upper basin will result in significant transfers of water from the wet to the dry season. The summary of the results is as follows: The overall character of the hydrograph is maintained. Low flows are significantly increased and are higher than the historically observed range High flows are marginally reduced, but within the historically observed range	This is the only report openly published of the DSF results and MRC scenario work. Therefore the importance of the results and whole document is unquestioned. Although the report well presents the results, the assumptions and limitations of the DSF work and scenarios within it are not well documented. The DSF work has been criticised by many, particularly its non-transparency. Therefore, there has been lots of questions about the reliability of the results.
BDP2	The preliminary results are as follows: The pattern of distinct dry and wet flow seasons in the Mekong mainstream is maintained under all considered scenarios In the foreseeable future (next 20 years), the main flow changes in the Mekong mainstream will be caused by hydropower development in the Upper Mekong Basin The flow changes caused by possible water resources developments in the LMB will result in small mostly positive changes in salinity intrusion in the Vietnam Delta and relatively small changes in flooding patterns around the Tonle Sap compared to the natural year-to-year variability The LMB mainstream dams would not cause flow changes beyond a daily timeframe	Within the BDP2 CIA excellent work has been done in putting together the planned development activities, particularly the hydropower schemes. The simulation results are still preliminary ones and therefore those cannot be yet examined in detail. They are, however, strictly hydrological based on the hydrograph and do not take into account the recent findings related to the importance of maintaining the flood pulse characteristics. I.e. even relatively small changes in the dry season water level may have significant impact in ecosystem productivity. Therefore, there is still development to be done in the analysis.
Adamson	The conclusions of the study are that construction of large scale regulation storage on the Upper Mekong in Yunnan will have a major impact on the hydrological regime of the entire lower Mekong mainstream, particularly during the March-April when the Yunnan proportion of the total flow is largest.	Adamson's work was the first one to estimate the impact of the hydropower development on the hydrology. Therefore, even though the analysis was limited to only Chinese cascade of dams and hydrology-sector the work has an important role within the CIAs. The work is done with rather simple water balance calculations in transparent way. Therefore, the results are easily understandable and repeatable.

All the tools are in their own category relevant to water governance in the Mekong (Table 9). One criterion for the relevance has been the transparency of the CIA process and how the results have been published. Another criteria was how the CIA has assessed the main issue(s) it was originally aimed for. The impact of each CIA is discussed as well briefly.

Table 8. Relevance of the tool in water governance and possible impacts of the CIAs.

CIA	Relevance	Impact
NT2	The CIA was done as a part of the NT2 project preparation. However, it also included the cumulative impacts of all the future water resources related development plans. The study was finalised, however, only after the construction of the NT2 had basically started. Therefore, the relevance for the NT2 project itself remains a bit questioned. The wider relevance for the study for water allocation governance may have some significant as the CIA was the first transparent and well documented CIA in the Mekong Basin.	For the NT2 project the CIA did most probably not have great impact as described on the left. However, being the first CIA in the Mekong, it might have (had) impact on the following CIAs and ways of analysing the cumulative impacts in the basin.
NN3	The study has been made for one tributary of the Mekong and therefore, the basin wide relevance for water allocation governance is small. However, the more local relevance is larger as the study includes multi-sectoral analysis of various development plans in the Nam Ngum catchment. The hydrology part of the CIA is, however, very weak and has no relevance at all.	The impact of the tool could not be analysed or discussed at this stage.
WB	Tool has been used in the MRC and in some account also in the countries. This is the only tool approved by all the MRC countries and thus, its relevance within MRC and NMCs is significant. However, the transparency of the process outside MRC has not been very successful.	The tool has been criticised by many due to its non-transparency and largely unpublished results. Therefore, the impact of the results might have suffered from that. However, the total impact of the study is hard to analyse.
BDP2	The work is undergoing and therefore, the relevancy of the work cannot yet be analysed.	Within the BDP2 lots of efforts have been put to improve many of the shortcomings of the BDP1 (here referred as WB). Those are e.g. transparency, stakeholder participation, etc. Therefore, the impact of the process may increase from its ancestor.

CIA	Relevance	Impact
Adamson	First attempt to estimate the impacts of Chine dams on hydrology. Relevance to the water allocation governance is thus somewhat significant.	Being first attempt to estimate the impact of Yunnan cascade of dams, this is important study. Further, Adamson (2001) showed with his study that it is possible to assess the hydrological impact with very basic tool (here water balance calculations) and that there is not always necessity for expensive and complicated tools.

The improvement of the CIAs on the Mekong Basin water governance is briefly discussed for each assessment in Table 10. It is not straightforward, however, to assess such an impact. It is here assessed mainly based on the transparency of the project and how each assessment has impacted on the CIA field itself. The NT2 assessment was first CIA in the Mekong and well documented. Thus, it has got lots of attention. The first phase of BDP work has not been published by MRC and the overall process of DSF has not been very transparent. Thus, the impact has been rated not that significant. However, the BDP phase 2 has improved the participation and thus, its impact on the water governance issues might increase the importance of DSF outside the MRC.

Table 9. Improvement of water governance.

CIA	Improvement of water governance
NT2	For the actual NT2 project the improvement was small. For the Mekong basin water governance, however, the improvement was probably more significant as this was the first CIA applied in the basin.
NN3	N/A
WB	Relatively small; large project but the documentation of the tool and its results have been poor. Therefore, although the countries have been involved in the modelling activities, the work has merely stayed inside the MRC and CNMs. The findings neither methodology was not transferred well to the wide public.
BDP2	Work is undergoing. It is therefore too early to be analysed its improvement compared to the first phase of BDP work. The preliminary results were presented in MRC's hydropower consultation 2008 being the first such an attempt where most of the stakeholders have been present. Thus, it seems that the results will be available for the public more openly and the whole process will be more transparent compared to the first phase.
Adamson	This was the first attempt to analyse the hydrological impacts of Chinese cascade of dams. Thus, potentially its impact has been significant on the water allocation issues in the Mekong.

V. Broad implications, challenges, and opportunities: The way forward for SEA and CIA in the Mekong Region

Challenges with current impact assessment practices in the Mekong Region indicate that there is a great need for more strategic and cumulative assessment approaches. Consequently, the increased attention towards both Strategic Environmental Assessment (SEA) and Cumulative Impact Assessment (CIA) at both national and regional levels is a promising sign. At the same time, however, the approaches have also a potential to be used in wrong ways, in terms of both methodology and substance. To prevent this to happen, it is important to understand what the different assessments are actually supposed to be doing, and also to be actively involved in the assessment processes to ensure that these objectives are not forgotten or neglected.

In terms of SEA, the current, relatively limited experience from the Mekong Region shows that while the SEA has a great potential to raise discussion about more strategic dimensions of water resources development, such dimension is also relatively easy to neglect. As a result, the assessments are easily reduced, for example, to cumulative assessment of already planned projects, rather than more strategic assessment of the actual impacts –and underlying reasons– for current development plans and policies. The SEAs may also be misused in other ways, for example by setting the scope of the assessment so that the alternatives for suggested plans are either out-of-date or are having clearly greater environmental impact, indicating that the assessed plans would be the best option after all. A truly strategic assessment should, however, also be able to think ‘out of the box’, and consider altogether new, emerging alternatives.

The interest towards the CIA has also increased rapidly in the region during the recent years. As presented above, there have already been couple of CIAs done in the Mekong Basin (ADB 2004, 2008; SEA Study Team 2008a) and few that can be classified as being CIAs (Adamson 2001; World Bank 2004b; MRCS/BDP2 2009). Those five CIAs have been analysed in previous chapter. The basin-wide CIAs implemented so far have had, however, also clear shortcomings, and their influence on the actual water policies can be seen to be rather small. Among the main reasons for this is that the CIAs are either done too late when the project is already commissioned to be started (e.g. ADB 2004), or the dissemination and documentation of the assessment have been insufficient and/or non-transparent (World Bank 2004b).

On the other hand the already implemented CIAs provide an important experience on the pros and cons of the method and its application in the region. Related to this, there are promising signs that for example the on-going CIA at MRC (MRCS/BDP2 2009) seeks to learn from the shortcomings of the BDP’s first phase. Nevertheless, there is still an urgent need for scientifically sound CIA in the Mekong done by independent researchers with transparent and coherent tools, data, development scenarios, etc. In terms of models used in the assessment, the CIAs would also benefit from using results from various hydrological models to enhance the reliability –and transparency– of the hydrological impact assessments of the development scenarios. In addition, the dissemination of the assessment results is extremely important for assessments to really impact planning and decision-making. Communication and information dissemination should thus be addressed much better in the upcoming assessments.

These kind of practical recommendations provide, however, only the starting point on the way towards more comprehensive and engaging impact assessment. A truly meaningful impact assessment requires also the recognition of the highly political nature of water development, and consequently, of planning and impact assessment processes. The underlying reasons –and solutions– for the challenges with impact assessment are therefore likely to lie beyond merely methodological issues, and can instead be found from broader political processes related to water development. For this reason, impact assessment should build on transparent processes, and encourage dialogues with different stakeholders about the requirements, methods and assumptions used as well as the results achieved in the assessments. This kind of more open impact assessment approach can also help to facilitate discussion about the different development options, their impacts and consequent trade-offs, and, ultimately, can lead the assessments to be both strategic and cumulative by their very nature, building on the needs, concerns and ideas of different stakeholders (Keskinen 2008).

Although it can be argued that both the SEA and CIA in the Mekong Region may in many cases be “too little and too late”, we consider them to be worth supporting and striving for. For even with their limitations, they provide more comprehensive approaches to impact assessment than the currently dominating EIAs and other impact assessment approaches. At the same time there is a real danger that they –and particularly the CIA that requires advanced technical expertise– lead to overly specialised, technical discussion about the potential impacts of water resources development, leaving thus most of the stakeholders out from the discussions. Due to their focus on the issues at macro scale, the assessment may also neglect the existing diversity of local contexts in different countries. Finally, both the approaches have also –like any other approach– a potential for misuse and abuse, and they can also be used to depoliticise and ‘saniticise’ development decisions. To prevent this to happen, it is important to follow up closely the implementation of both SEA and CIA as well as to keep emphasising the crucial importance of openness and transparency in such processes. Neither the SEA nor the CIA can be considered as silver bullet, but they do represent two promising tools to advice and facilitate discussion about the ways forward for the water development in the Mekong Region.

VII. Acknowledgements

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VIII. Annexes

VIII.1 Annotated bibliography

The key literature is annotated below, separated to CIA and SEA. The full list of references for the entire report follows after this.

Annotated bibliography – SEA

Web:
There are few web sites that offer information and practical guidance on SEA (most of it in the European context, though) as well as some websites describing the current SEA processes in the Mekong Region:

http://sea.unu.edu/

http://www.sea-info.net/

http://www.seataskteam.net/

http://ec.europa.eu/environment/eia/sea-support.htm

http://www.unece.org/env/sea

http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/0,,contentMDK:20885941~menuPK:2450778~pagePK:148956~piPK:216618~theSitePK:244381,00.html

http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/EXTEAPREGTOPENVIRONMENT/0,,contentMDK:20438708~menuPK:502915~pagePK:34004173~piPK:34003707~theSitePK:502886,00.html

http://www.gms-eoc.org/CEP/Comp1/Component1.aspx

http://www.gms-powertrade.net/dsp_page.cfm?view=page&select=4

http://www.mrcmekong.org/ish/sea.htm

Literature:

ADB, 2009b. Harnessing Hydropower for Development – A Strategic Environmental Assessment for Sustainable Hydropower Development in Viet Nam, Policy summary, Asian Development Bank (ADB) and GMS Environment Operations Center, Bangkok, Thailand. Available online at: http://www.gms-eoc.org/CEP/Comp1/docs/SEA_HarnessHydropower.pdf

To our knowledge the first SEA process implemented in any Mekong country in relation to overall hydropower development. The SEA process described in the policy summary was essentially a pilot assessment implemented in the context of Vietnam's Power Development Plan VI, supported by the ADB's Greater Mekong Subregion Core Environmental Program and aiming to build capacities for the integration of SEA into the strategic planning of hydropower in Viet Nam, including the preparation of PDP VII. The policy summary includes descriptions of the five phases of SEA (Scoping; Baseline Assessment; Scenarios; Impact Analysis; and Weighting and Trade-Off Analysis) as well as overall conclusions and recommendations.

ICEM, 2008, Strategic Environmental Assessment of the Quang Nam Province Hydropower Plan for the Vu Gia-Thu Bon River Basin, International Centre for Environmental Management (ICEM), prepared for the ADB, MONRE, MOITT & EVN, Hanoi, Viet Nam. Available online at: *http://www.adb.org/Documents/Reports/Consultant/39536-VIE/default.asp*

A report describing a pilot SEA process for hydropower development in Vu-Gia Thu Bon River Basin in Vietnam that has currently around 60 proposals for hydropower projects. The objective of the pilot SEA was to demonstrate SEA methodology and good SEA practice through the assessment of hydropower proposals and other development activities in the basin, testing thus practical approaches for undertaking SEA in Vietnam. The report recognises 15 key economic, social and environmental themes of concern to sustainable development in the basin. In addition, seven "fundamental principles" that must underpin hydropower development in the basin were recognised: Net provincial economic gain; User pays; Multiple use; Safe operations; Net biodiversity gain; Net gain in minority well being; and Precautionary principle.

OECD/DAC, 2006. Applying Strategic Environmental Assessment – Good Practice Guidance for Development Cooperation, DAC Guidance and Reference Series, the OECD Development Assistance Committee (DAC), Organisation for Economic Co-operation and Development (OECD). 160 pages. Available online at: *http://www.oecd.org/dataoecd/4/21/37353858.pdf*

A guideline report providing introduction to SEA and its use in development cooperation in particular. The report also aims to provide practical guidance on how to actually apply SEA in practice, and does this by presenting guidance notes and checklists for 12 key entry oints. The emphasis of the entire report is, however, perhaps bit too strongly on donor agencies.

Partidario, M.R. 2007. Strategic Environmental Assessment – Good Practices Guide: Methodological Guidance, Portuguese Environment Agency, Amadora. Available online at *http://www.seataskteam.net/index.cfm?module=Library&page=Document&DocumentID=6477*

A report seeking to provide methodological guidance in implementing SEA in Portugal that seems to be one of the most developed countries in terms of SEA legislation and regulations. Although focus of the report is thus strongly on

European context (with references to UNECE Protocol on SEA), the report includes some interesting examples of the theories behind the SEA and its implementation.

Partidario, M.R. 2004. Strategic Environmental Assessment (SEA) – current practices, future demands and capacity building needs, Course Manual, IAIA Training Courses, International Association for Impact Assessment (IAIA).

A training course manual that was prepared to assist a two days training course of International Association for Impact Assessment (IAIA) on SEA. The manual contains background information on the evolution, concepts and principles of SEA. It also refers to existing legislation, procedure and guidance on SEA, reproducing examples from different contexts in Europe and North America. The manual also seeks to address the practical implementation of SEA, although it still remains largely theoretical.

Soussan, J., 2009. Phase 1: Background Scoping Paper - For a Strategic Environmental Assessment of Proposed Hydropower Developments on the Mekong Mainstream in the Lower Mekong Basin, Prepared by Professor John Soussan, Stockholm Environment Institute - Asia. Available online at: http://www.mrcmekong.org/ish/sea.htm

A report of the initial scoping study for the Mekong River Commission's SEA, providing an introduction to the SEA approach as well as more specific guidelines and data needs for applying SEA in the Mekong Region and within the MRC. The report includes a summary of the results from consultations in the four MRC member countries about the most important strategic issues considering hydropower development, concluding that the complex and multi-faceted nature of hydropower development is widely recognized and noting that two issues stood out as having a strong consensus on their significance: the impacts on project affected people and the importance of likely ecosystems changes. It is also notable that all people interviewed regarded the issue of mainstream dam construction as "the most significant issue facing the river basin in contemporary times, and also the most challenging issue that the MRC will need to address for the foreseeable future". The report also recommends that already "the initial stages of the SEA contain extensive consultations with a full range of stakeholders".

Soussan, J., Nilsson, M., Sinh, B. T., Lifwenborg, G. Tu, P. Q., Lam, T. Q., Hung, N. N. & Linde, L. 2009. Strategic Environmental Assessment of the Hydropower Master Plan in the Context of the Power Development Plan VI, Final Report, Stockholm Environment Institute (SEI).

This 143-page report represents the documented outputs of a 15-month process of analysis and consultation on SEA of Vietnam's hydropower master plan. The report focuses on the methods, study and results of assessing the social and environmental consequences of hydropower development in Viet Nam. The report notes that the process illustrated that "SEA provides a powerful tool for the analysis of the social and environmental impacts of hydropower development". The report considers also alternatives for the hydropower, focusing on coal-fired thermal plants and combined cycle gas turbines as "feasible alternative sources of power generation". The report basically gives green light for hydropower development in Viet Nam, concluding that the "level of hydropower development envisaged in Power Development Plan VI can be justified when compared to the feasible alternative sources of power generation, which have higher economic, social and environmental costs". The report also notes, however, that the "present approaches to address social and environmental issues in hydropower

development are not adequate and more effective mitigation and compensation measures must be introduced".

UNECE, 2003. Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context, United Nations Economic commission for Europe (UNECE). Available online at: *http://www.unece.org/env/eia/sea_protocol.htm*

Official, legal text describing the protocol on SEA as adopted in Kiev in May 2003 by 38 states and the European Community; it may be a good idea to complement this legal text with explanatory notes available at http://www.unece.org/env/sea. The protocol supplements the Convention on Environmental Impact Assessment (EIA) in a Transboundary Context (so-called Espoo Convention), and although it was negotiated under UNECE, it is open to all members of the United Nations, and could thus be adopted also in the Mekong Region. The protocol also calls for extensive public participation in government decision-making in numerous development sectors, with public having the right to comment, have their comments taken into account, and be told of the final decision and why it was taken. The protocol has not, however, yet entered force as it needs still to be ratified by at least 16 UNECE Member states.

Veerheem, R.A.A and Tonk, J.A.M.N. 2000. Strategic Environmental Assessment: one concept, multiple forms, Impact Assessment and Project Appraisal, Vol. 18, No. 3, pp. 177–182.

This concise scientific journal article discusses the early development of SEA and the challenges in its actual implementation in practice due to its various different forms. To overcome the confusion over different forms of SEA, the article also recommends certain generic SEA principles regarding: Screening; Publication; Monitoring; Timing; Environmental scoping; Socio-Economic Scoping; Views of the public; Documentation; and Quality Review. The focus of the article is, however, only on developed countries, with case study presented from the Netherlands.

World Bank, 2006. Environmental Impact Assessment Regulations and Strategic Environmental Assessment Requirements – Practices and Lessons Learned in East and Southeast Asia, Environment and Social Development Department, East Asia and Pacific Region, The World Bank, Washington, D.C. Available online at: *http://siteresources.worldbank.org/INTEAPREGTOPENVIRONMENT/Resources/EIA&SEA-regional-review.pdf*

A report summarising the status of EIA and SEA regulations and requirements in 12 East and Southeast Asian countries, including five Mekong countries (excluding only Burma/Myanmar). The country profiles annexed into the report provide a handy summary of the official situation in different countries regarding the situation with SEA, including also potential for SEA in different countries. However, due to increased emphasis on impact assessment and related regulations, some parts of the report may already be partly out-of-date.

Annotated bibliography – CIA

ADB. 2004. Cumulative impact analysis and Nam Theun 2 contributions. Final report. Prepared by NORPLAN and EcoLao for Asian Development Bank. 143 p.

This report presents the results of the CIA of the Mekong basin development activities, concentrating on hydropower. The study can be categorised as hydrological CIA (i.e. sectoral CIA). The work was undertaken by Norplan and EcoLao. They used Mike Basin and Mike 11 models for the assessment. The report provides rather transparent and well documented CIA. The CIA conducted and

results of that are analysed in more detail in the CIA part of the Tool reviews of PN67.

ADB. 2008. Lao People's Democratic Republic: Preparing the Cumulative Impact Assessment for the Nam Ngum 3 Hydropower Project. Prepared by Vattenfall Power Consultant AB in association with Ramboll Natura AB and Earth Systems Lao. Asian Development Bank (ADB). 394 p.

This report purposes to assist ADB in its preparations for financing of the proposed Nam Ngum 3 Hydropower Project (NN3), located in the Nam Ngum River Basin (NNRB) in Vientiane Province, in central Lao PDR. The outcome of the report is a strategic assessment of the entire Nam Ngum basin and the expected cumulative impacts of the extensive hydropower development programme identified for the basin. The work is closely related to another ADB project, the Nam Ngum River Basin Development Sector Project (NNRBDSP).

Cooper, L. M. 2004. Guidelines for Cumulative Effects Assessment in SEA of Plans. EPMG Occasional Paper 04/LMC/CEA, Imperial College London. 49 p.

Report provides guidelines for cumulative effects assessment (CEA) at strategic level. CEA can be undertaken as part of regional planning and land use studies but these guidelines have been developed to incorporate CEA into strategic environmental assessment (SEA) of development plans.

The report consists of two parts: Part I provides the background and context for cumulative effects assessment, introducing the concept of cumulative effects and discusses the importance of addressing these impacts at a strategic level. The CEA process at strategic level is presented. Finally, it defines the role of CEA in the SEA process. Part II consists of the guidelines. Guiding principles for CEA are outlined. The report also explains how CEA fits within each stage of the SEA and plan preparation processes. Methods for addressing cumulative effects at each stage are discussed in terms of their strengths and weaknesses.

Hegmann, G., C. Cocklin, R. Creasey, S. Dupuis, A. Kennedy, L. Kingsley, W. Ross, H. Spaling, and D. Stalker. 1999. Cumulative Effects Assessment Practitioners Guide. Prepared for Canadian Environmental Assessment Agency by the Cumulative Effects Assessment Working Group AXYS Environmental Consulting Ltd and the CEA Working Group for the Canadian Environmental Assessment Agency, Hull, Quebec. 134 pp.

This guide has been intended mainly for the practitioners who are responsible for preparing Cumulative Effects Assessments (CEAs). The purpose of this report is to provide practitioners with: a) an overview and clarification of current understanding about the practice of CEA; b) suggestions on practical approaches to complete CEAs that meet statutory requirements and best professional practice; and c) case studies of approaches used by project proponents for their CEAs.

MacDonald, L. H. 2000. Evaluating and Managing Cumulative Effects: Process and Constraints. Environmental Management 26(3):299-315.

The focus of the paper is on the analytical aspects of assessing and managing CEs in natural resource systems. The paper will emphasize cumulative watershed effects, as these have been the most extensively studied and continue to be a flashpoint of concern. The paper aims to develop more rational procedures to assess CEs, clarify key issues for public debate, and ultimately help ensure that the limited resources for environmental regulation are utilized as efficiently as possible.

MRCS/WUP-FIN. 2007. Final Report - Part 2: research findings and way forward. WUP-FIN Phase 2 - Hydrological, Environmental and Socio-Economic Modelling Tools for the Lower Mekong Basin Impact Assessment. Mekong River Commission and Finnish Environment Institute Consultancy Consortium, Vientiane, Lao PDR. 126 pp. Available on-line at http://www.eia.fi/wup-fin/wup-fin2/publications.htm.

This report is a product of an extensive collaboration of Finnish, international and riparian experts. The purpose of the report is to describe and justify the approaches and strategies applied within the project as well as to summarize and synthesize the main results and findings of the WUP-FIN Project into general conclusions and recommendations. The report argues that without primary studies and data collection it is impossible to draw conclusions of process behaviour (nature, society) that is necessary to reliably assess the diverse impacts of different development plans.

This report presents the main findings from all of the WUP-FIN activities and results: technical reports, working papers and publications that are available for studying the details of our field surveys, data analysis, model developments, socio-economic and policy analyses as well as impact assessment case studies. The report also brings the findings and recommendations into the discussion with experts, practitioners as well as with other stakeholders.

Sadler, B. 1996. Environmental Assessment in a Changing World: Evaluating practice to Improve Performance. Page 263. International Study of the Effectiveness of Environmental Assessment Final Report. International Association for Impact Assessment and Canadian Environment Assessment Agency, Canada.

This report comprises the framework, findings, conclusions, and recommendations of the International Study of the Effectiveness of Environmental Assessment. It presents the key points and issues related to the practice of environmental assessment.

In Chapter 6 it reviews the SEA practises and concludes that SEA is viewed as a promising avenue for incorporating environmental considerations into the highest levels of development decision making. However, SEA systems are still at a relatively early, formative stage. Many practical questions remain about procedures, methods and institutional frameworks. The report presents the good practice guidance on the application of SEA and a disciplined approach to using SEA to address cumulative effects.

Therivel, R., and B. Ross. 2007. Cumulative effects assessment: Does scale matter? Environmental Impact Assessment Review 27(5):365-385

This article reviews how CEAs consider, and could consider, scale issues: spatial extent, level of detail, and temporal issues. It is based on an analysis of Canadian project-level CEAs and UK strategic-level CEAs. Based on a review of literature and, especially, case studies with which the authors are familiar, it concludes that scale issues are poorly considered at both levels, with particular problems being unclear or non-existing cumulative effects scoping methodologies; poor consideration of past or likely future human activities beyond the plan or project in question; attempts to apportion 'blame' for cumulative effects; and, at the plan level, limited management of cumulative effects caused particularly by the absence of consent regimes. Scale issues are important in most of these problems.

However, article continues, both strategic-level and project-level CEA have much potential for managing cumulative effects through better siting and phasing of development, demand reduction and other behavioural changes, and particularly through setting development consent rules for projects. The lack of strategic resource-based thresholds constrains the robust management of strategic-level cumulative effects.

World Bank. 2004. Modelled Observations on Development Scenarios in the Lower Mekong Basin. Mekong Regional Water Resources Assistance Strategy. Prepared for the World Bank with Mekong River Commission cooperation. 142 p.

This report gives a brief overview on the Decision Support Framework (DSF) under Mekong River Commission, and mainly on its hydrological component. DSF comprises a suite of models that make it possible to simulate major hydrological aspects of river basin behaviour, which can in turn support and inform the negotiations that are now addressing the water-sharing issues.

This report summarises the results of modelled scenarios on the basis of agreed key indicators. The scenarios have been selected to represent feasible development scenarios - some balanced, others unbalanced - thus providing a range of possible outcomes.

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VIII.3 Acronyms and Abbreviations

ADB Asian Development Bank

BDP Basin Development Plan of the MRC

CEA Cumulative Effects Assessment

CIA Cumulative Impact Assessment

DSF Decision Support Framework – MRC's suite of computer-based numerical modelling and knowledge based tools

EA Environmental Assessment (common term for different environmental assessment methods)

EIA Environmental Impact Assessment

EIA Ltd. Environmental Impact Assessment Centre of Finland (www.eia.fi)

FR1, FR2, FR3 Flow regimes under IBFM, DSF model results

GIS Geographical Information System

HIA Hydrological Impact Assessment

IA Impact assessment

IAIA International Association for Impact Assessment

IBFM Integrated Basin Flow Management process of the MRC

IKMP Information and Knowledge Management Programme of the MRC

IWRM Integrated Water Resources Management

LMB Lower Mekong Basin

MRC Mekong River Commission (www.mrcmekong.org)

MRCS Mekong River Commission Secretariat

SEA Strategic Environmental Assessment

SIA Social Impact Assessment

UMB Upper Mekong Basin

VA Vulnerability Assessment

WB World Bank

WUP-FIN Lower Mekong Modelling Project under Water Utilization Programme of the Mekong River Commission (www.eia.fi/wup-fin)

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Contestations over Water Quality in Thailand and Vietnam in the Context of Peri-Urban Change and Globalization
Edsel E. Sajor

Table of contents

Abstract

In the Mekong Region countries, peri-urban change driven by globalization seriously affects local water resources. This can occur in two ways – through intrusion in the agricultural landscape of urban land uses that negatively impact on local water; or through livelihood diversification of households and their engagement in new own-account entrepreneurial activities that immediately reconfigure and complicate pre-existing water uses in the periphery. This article investigates the latter through the use of two local case studies in Sam Rauen sub-district in Thailand and in Van Mon commune in Vietnam. The cases show how new water-using entrepreneurial activities of village households have created new demand for an appropriate quality of water in irrigation canal (in the case of Sam Ruaen) and/or generates new water pollution source that degrades existing irrigation and river bodies (in the case of Van Mon), which jeopardizes traditional uses of local water bodies and sharpen contestations over water quality. Existing water- and land-related institutions in Thailand and Vietnam, which have remained single-focused, administratively fragmented and territorially bounded, and lacking in tools and capacity for regulating dispersed household based production, are practically inutile in managing water and environment in the midst of this development. The author argues for a distinctly peri-urban perspective in water management in the rural-urban interface, which among others, should address both water quantity and quality issues, macro-national and local trans-boundary problems, and most importantly, the complex trade-offs between livelihoods and environment/health at household and community level.

Among countries in the Mekong Region, Thailand and Vietnam have in recent decades experienced the most rapid urbanization and peri-urbanization. They have also linked most robustly with the global, particularly with the international market and capital by liberalizing their trade and investment. Thailand's economy became transformed from an agriculture-based to an export-oriented manufacturing and service economy in the 80s, with the unprecedented rise of foreign direct investment and ballooning of exports. This development has become spatially expressed in urban expansion, and massive land conversions in the urban periphery with dramatic consequences on the state of water resources in these areas. On the other hand, Vietnam's economy has been undergoing reforms since the middle of the 1980s, after the *Doi Moi* policy that radically liberalized foreign investments, and introduced privatization and market reforms. This too has spurred the expansion of its main cities, and the transformation of extensive rural landscapes into peri-urban zones, with major consequences on land and water resources in the localities.

This article aims to further investigate how transformations in the peri-urban of these two countries, influenced by the broader forces of globalization, have resulted in changes in local water resources. It departs however from a focus on the link between land use change and water degradation. Instead, it particularly investigates local socio-economic changes as response to globalization and how these lead to new contestations on water use and associated water quality in communities and households in the peri-urban. This is obviously a less dramatic change in the peri-urban water resource domain; but no less important and perhaps, even a more pervasive change process unfolding.

This article is structured in the following. Part I reviews related literature on peri-urban change, globalization and local water resources; Part II presents two narratives of new entrepreneurial activities and their impact on local water resources; Part III infers the implications of these cases on water management in the peri-urban of Thailand and Vietnam; and, Conclusions argue the meaning and significance of a distinct peri-urban perspective in water management.

I. Peri-urban Change, globalization and local water resources

A conventional notion of understanding peri-urban interface is from a spatial perspective of city expansion or urbanization. The latter's spatial dynamics of combined densification and outward spread of people and built areas may create a distinctive type of urban region where a single major city is of central importance and surrounding land is closely linked to it (Foreman 2008: 12). Particular to developing countries in the Asia-Pacific region, expansion of urbanization has taken a form widely known as Extended Metropolitan Regions (EMRs), an essentially city-centered regional growth, characterized by a complex of cities, towns, and urban-oriented rural population (Smith 2001; Pacione 2001: 443-445). Mc Gee (1991) initially coined the term *desakota*[1], but then adopted the concept of 'extended metropolitan regions' (McGee and Greenburg 1992). In middle-income countries developing countries of Southeast Asia, rapid growth of mega regions around national capital primate cities, a process encompassing nearby provinces, has characterized these countries' urban landscapes.

Revisiting the concept of *desakota*, McGee (2003) referred to it as peri-urban areas, whose one defining element is the juxtaposition of the larger city cores within heavily populated intensive agricultural regions. This form has created a mixture of agriculture and non-agriculture activities and marked heterogeneity of land uses, mosaics of temporary, new residents and activities, mingled with longstanding land uses (Douglas 2006; Lynch 2005; Hardoy, Mitlin and Satterthwaite 2001). This has strongly put in question a widely accepted notion of spatial separation of rural and urban activities and departs from attempts at identifying discrete spatial boundaries. The focus is instead on conceptual distinctions and a process orientation, examined from a perspective of a continuum between poles of the urban and rural, and on understanding the

[1] From the Malay words for village and city.

dynamics of change as they affect particular parts of the peri-urban zone, as well as shifts in the position of the zone as a whole (Simon et al: 2006).

Peri-urban concept therefore can also be regarded as both a spatial and temporal heuristic to capture one frontier space or context in a particular transition (Hirsch 2009), a notion that is still consistent with *desakota* metaphor – that is, a hybrid zone with its own characteristics of diverse land uses, occupational mixes and juxtaposed marker of urbanity and rurality. Using Thailand as his observational field, Hirsch highlights three important characteristics found in the peri-urban as a frontier context of transition: (1) as new opportunities for capital; (2) as social space for deepening class relations accompanied by extreme degree of occupational diversity within households, and presence of new forms of production and own-account business; (3) enmeshing of environmental issues in the dynamics of development (Ibid). These three important inter-related characteristics of the peri-urban, I will argue and empirically illustrate later, have direct causal contribution to intensification of contestation over quality of water in localities. These dimensions of the peri-urban become more pronounced in the context of globalization, to which I now turn to.

Globalization is multi-dimensional and not easily summarized, encompassing transnational and local linkages and intersecting vectors of changes in the economic, social, political and cultural fields driven by major improvements in communication, information and transportation technology. Its impacts on cities' expansion and peri-urbanization are well known. In Southeast Asia for instance, many scholars have attributed the spatial expansion of core cities into mega urban region form to the effects of globalizing forces such as foreign direct investment (FDI) operating in partnership with domestic capital in export-oriented manufacturing, and residential, commercial, and leisure projects in a context of highly liberalized and supportive national policies (Kelly 1999; Firman 2000; Goldblum and Wong 2000; Marcutullio 2003).

Particularly in Thailand, expansion of industries in the erstwhile farming provinces creating a heterogeneous mix of land uses has been associated to FDIs rise (Parnwell and Wonguphsawat 1997), and of foreign investments and partnerships in real estate sector in aggressive building of middle and up-end luxury housing estates that are sited farther and farther from the core city of Bangkok (Hewison 2001; Evers and Korff 2000; Setchell 1995). On the other hand, in Vietnam, Hanoi's and Hochiminh's dramatic expansion to nearby rural areas has occurred after the *Doi Moi*, which opened up the economy to international capital and introduced the market economy. Transformation is currently unfolding in Vietnam, with urban land uses and economic activities moving extensively into the densely populated Mekong Delta and Red River basins around the two cities and engulfing many villages and linking them into an emerging EMRs (Smith 2001).

However, globalizing forces that push forward the peri-urban change process is not only played out by way of engulfing many villages or 'rolling over farmland or natural land' (Foreman 2008:10). Globalization also induces social and economic changes in local villages in the urban edge in the context of their enhanced trans-local and trans-national connectivities, which result in transformations in the periphery. Leaf (2002) illustrates the urban impacts of these increasing connectivities in China and Vietnam through two village studies and how intra-village diversification and rise of investments triggered by enhanced local-global transformed in a wholesale manner these villages in the urban edge. Time-space compression dimension of globalization (Harvey 1989) has also transformed rural *kampungs* in Malaysia as urban social spaces, at present also characterized, among others, by multiplicity and diversity of sources of livelihoods and occupations of local households (Thompson 2004)

The question then arises what are implications of these globalization-driven peri-urban changes to water resources and use by villages at the urban edge or farming communities undergoing land use changes and unprecedented diversification of economic activities and own-account entrepreneurship?

The above question is of special significance to the two rapidly urbanizing countries in the Mekong region, Thailand and Vietnam. Many local communities that are at the edge of big cities of the two countries lie in deltaic zones, drained by rivers and man-made water canals which continue to be important resources to traditional livelihoods such as farming, livestock raising and fishing. Peri-urban change in these areas would unavoidably impact on existing water quality and associated uses. These can occur in two ways. First, the edge of the urban in the two countries, as an outcome of urbanization and enhanced global linkages, is intruded by new residential, commercial and industrial estates rendering their territory as virtual checkered landscapes of farms and urban enclaves and having major impacts on local water. Secondly, many local communities on the urban edge diversify their livelihoods, engaging in certain own-account and household-based new entrepreneurial activities that immediately reconfigure and complicate further pre-existing water uses in the vicinity.

The effects on water quality and associated water uses of intrusive urban development and the juxtaposition of urban land use in farming areas in Thailand have been discussed elsewhere by the author in a district level study in Bangkok peri-urban (Sajor and Ongsakul 2007; see also Askew 2003). What would seem not to have been addressed thus far in the emerging water and peri-urban literature in Southeast Asian countries pertains to how diversification of livelihoods and new entrepreneurial activities in peri-urban localities impact on traditional uses of water and contestations over appropriate water quality. How these are played out is important in our understanding of the notion that urban-rural tensions in the domain of the environment and natural resources 'have not only become spatially extended but more intense at the local level' (McGranahan, Satterthwaite and Tacoli 2004).

In the following, I will present two cases of how these tensions are played out at the local level. One case is in Ratchaburi, Thailand and the other in the Hanoi, Vietnam

II. Two narratives of new entrepreneurial activities and water in peri-urban villages

Sam Ruaen in Ratchaburi Province, Thailand

Sam Ruaen Sub-district is one of the seven sub-districts (*tambon*) of Muang District in Ratchaburi Province, a province located in the central plain of Thailand. Ratchaburi Province has a total population of 820,000 and an average per capital income of 1,800 USD annually. Like most of the provinces surrounding Bangkok Metropolitan Region, Ratchaburi's economy has undergone de-agrarianization in recent decades, as reflected in the proportion of major sectors' share in the provincial economy. Service sector contributes the biggest share (51.8%), followed by industry sector (33.8%) and agriculture (15.4 %).

Sam Ruaen is located in Muang Ratchaburi District, one of the nine districts making up the province. Muang Ratchaburi covers and area of 430 square km. Its population of 196,000 (2009) is the largest among the districts. Sam Ruaen sub-district is 80 kilometers west of Bangkok and a mere 20 kilometers away from Muang municipality, the capital city of Ratchaburi Province. It is comprised of three villages (*moo*), and has a total household population of about 100. It is connected to the provincial capital by a first-class four-lane highway, a mere twenty-minute motor vehicle travel. The geographic location of Sam Ruaen thus renders it easily responsive to the urbanizing influences coming from Bangkok mega city itself and from nearby Muang municipality, the urban commercial and educational urban center of Ratchaburi.

Bang Pa Canal, a 37-kilometer natural supplementary waterway, originates from the upstream of Mae Klong River, a major river in Ratchaburi Province that empties into the Gulf of Thailand in Samut Songkram at the Bay of Bangkok. The canal passes through six districts of the province. When water level in Mae Klong is high, water gates in Bang Pa Canal are opened to allow water flow. In Muang district, the canal flows in Sam Ruaen directly coming from Don Sai, a neighboring sub-district. From Sam Ruaen, Bang Pa Canal courses through Bang Pa sub-district, the last area before it courses back to Mae Klong River.

Due to its location, that part of the Bang Pa Canal that runs through Sam Ruaen has been at the receiving end of water pollution from development upstream. In 1996, in Don Sai sub-district, the area in the middle of Bang Pa canal was developed into a 1,430 *rai*[2] industrial zone, where a number of export-oriented factories, including garment, textile, aluminum and metal industries, have been located. According to village informants,[3] a number of these factories discharge their wastewater into the canal, especially at night. Many of these factories have not been complying with the regulation requiring point-source treatment of wastewater before discharge.

Industrial pollution is further compounded in the canal downstream in the southern section of Don Sai. Majority of households here have since been working in the factories in the industrial and have ceased to engage in crop farming. Many households too have shifted to setting up piggery and cattle farms, which have become a thriving industry primarily to supply the burgeoning meat demand of the huge population of Bangkok metropolitan region. Thus, water in Bang Pa Canal in this area downstream of the industrial estate is largely used for cleaning these livestock farms.

At present, there are thirty livestock farms in Don Sai sub-district. Typical size pig farms have 400 to 500 animals (classified as small farms). There are also several farms that have over 10,000 heads (classified as big farms). According to a survey of farms conducted in 2005, big farm operators normally have treatment system of wastewater. Small farms however do not generally treat their wastewater before discharge to the Bang Pa Canal. In addition, canal maintenance is generally neglected by local government and communities in Don Sai sub-district. Its banks are ill maintained and full of bushes and excessive hyacinth and weeds, which block free water flow.

Based on in-depth water analysis at several points of Bang Pa Canal in Sam Ruen sub-district conducted in December 2006[4], quality of water based on certain parameters is most critical near the main pollution source of piggery and livestock farms concentrated in neighboring Don Sai sub-district. At this point of the Bang Pa Canal bordering Don Sai, temperature of surface water is highest. It is also where TDS (total dissolve solid) value (1793 mg/l) exceeds the standard amount specified by the Royal Irrigation Department (less than 1300 mg/l). DO (dissolve oxygen) at the area nearest Don Sai has values lower than the official Pollution

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[2] One *rai* equals 1,600 sq. meter.

[3] Key informant interviews in Sam Ruaen (July 2007).

[4] In-depth water survey was conducted in the area in late December 2006 in six samples points along the Bang Pa Canal in Sam Ruen sub-district as baseline data gathering preparatory to what afterwards became a CIDA-AIT Southeast Asia Urban Environmental Project on “Community and Stakeholder Participation in Water Quality Improvement and Pollution Abatement in Bang Pa Canal” in Sam Ruen sub-district. The project was launched in the third quarter of 2007 and continued up to mid 2009. Water samples from the canal were tested in laboratory.

Control Department (PCD) standard. Hence, both TDS and DO values that excessively deviates from official standard can be attributed, in combination with a few other factors, to waste water discharges from livestock concentrated in Don Sai. (Incidentally, DO value is also lowest and below official standard near the area Pikulthong, another border sub-district, where three large piggery farms are operating).

Bang Pa Canal has traditionally been an important water source for people in the Sam Ruaen sub-district. Up to the end of the last decade, households in Sam Ruaen had been making a living mainly through paddy farming, orchard farming, and backyard livestock, activities that are highly dependent on water in Bang Pa Canal. This canal had also been used for domestic cleaning purposes. Rise in number of piggery farms, which increasingly became the source of water pollution of the canal in the neighboring district of Don Sai started in the 1980s. Village informants in Sam Ruaen say that even at that time there were already brewing tensions over water pollution perceived to be generated by the livestock and piggery farms in Don Sai since obviously this was seen as unfairly burdening the villagers' own use of water of adequate quality where their traditional livelihood activities depended on. However starting in the late 1990s, tension with Don Sai's over the latter's livestock farms' wastewater discharges took a new dimension, when households in Sam Ruaen started to engage in ornamental fish farming for export.

Ornamental fish farming for export to Japan was initiated in Muang municipality by a number of entrepreneurs in the late 1990s. After initial success, one of the pioneers introduced ornamental fish farming to Sam Ruaen. He initiated a few households to the new technology, and supplied the fingerlings and connection to merchants exporting ornamental fish. Farmers in the Sam Ruaen, especially in Moo 2, immediately took up the new livelihood activity due its comparatively high earning returns. By 2003, many households in Sam Ruaen had been engaging in ornamental fish farming. Today, around 20 percent of households have ponds. This has surpassed paddy farming, backyard livestock raising and orchard farming in terms of income returns for farmers. Thus, households who engage in ornamental fish farming are clearly those who are economically better-off in the community.

Ponds for ornamental fish farming have sizes ranging from 10 to 50 *rai*, which can hold approximately 10,000 fish per *rai.* Local fish farmers draw water mainly from Bang Pa Canal, through the use of pumps. Because farmers do not have treatment system before (and also after) water use, they just let the water to settle in their ponds for 4 to 5 days. Smaller farmers who cannot wait longer and who often opt to use immediately the canal water face greater risk of having unsuitable water for their fish. Ornamental fish are normally sold between one to six months of raising, depending on the size of fish being ordered from the export market. After all the fish have been harvested, the farmers will release water out to dry the ponds for 4 to 5 months before being used again in the following year.

Use of canal water by ornamental fish farming is far more sensitive to adequate quality compared to traditional water use in paddy farming, orchard farming and backyard livestock. Sam Ruaen fish farmers have been the most vocal nowadays in expressing concerns over deteriorating water quality in the Bang Pa Canal, especially blaming the amounts of pollution coming from the livestock farms of Don Sai. They have commonly experienced their fish die and float in the ponds, when water is colored dark green or brown. In these occasions they have to relocate their fish to another pond or change water immediately. With the presence of ornamental fishing activity, level of water pollution from the upstream, which was already tension-laden but still tolerable vis-à-vis traditional use, has become livelihood-threatening to a significant number of households in the Sam Ruaen. In this new context water quality has become a serious source of open conflict and tension between the local officials and residents of Don Sai, and the local officials and residents of San Ruaen.

Van Mon Commune in Bac Ninh Province, Vietnam

Van Mon Commune is located in Yen Phong District in Bac Ninh Province. It is between two important nearby urban centers, about 21 km northeast is Ha Noi and 7 km Southwest is Tu Son town. The commune is very accessible by roads and waterways. It is comprised of five villages, which are Quan Do, Quan Dinh, Phu Xa, Tien Thon and Man Xa, the village site of this case study.

Van Mon has a total area of 424.84 ha, of which 268 ha is agricultural land, 65.1 ha is residential land, 91.3 ha is special-use land and 0.38 ha is unused land. The commune has a population of 9359 persons and has 1709 households (based on the 2005 census). The annual population growth rate is 1.65. Of the total population, about 40% are in the working age. Seventy percent of adult workers are engaged in artisanal production and farming, while 30 % are purely engaged in rice farming. On average, per capita rice production is 167 kg of milled rice/6 months.

The average rainfall in the area varies between 1240 and 1598 mm per year. The rainy season often coincides with the prevalent period of the southwest or southeast wind (between May and October) accompanied by atmospheric turbulences (including tropical convergent strip, typhoon, tropical low pressure), creating long lasting medium and heavy rains (Bac Ninh DONRE, 2005). Rainfall during this period makes up about from 75% to 80% of the total annual rainfall. Rainwater creates a surface current, a part of which infiltrates to enrich the ground water in the area. Rainwater thus provides a considerable volume of water for production and daily activities of villagers; it is also a major medium for spreading pollution. Dry season, on the other hand, lasts six or seven months from November to May of the following year, when rainfall is very little, accounting between 15% and 20% of the total annual rainfall.

Flowing through the area of Van Mon with a length of about 2km and joining the Cau River in Van An commune of Bac Ninh province is Ngu Huyen Khue, an inland river originating from Chau Khe commune in Tu Son district. The river provides water for 5 districts including Yen Lang, Dong Anh, Tu Son, Yen Phong and Tien Du. The river's water is also used for irrigation purposes. It also receives waste sources of various types from the area.

Aside from being engaged in paddy farming as their traditional major occupation, households in Van Mon have engaged in aluminum melting. This artisanal production began under the system of cooperative production brigade in the mid-60s. With the collapse of the cooperative model, household-based artisanal production increasingly displaced these cooperatives.

Man Xa, one of the villages of the commune, has been experiencing most prosperous period of aluminum melting since 1982. A number of households in the village also conduct lead, and zinc melting. Aluminum melting was boosted by the *Doi Moi* policy officially adopted in Vietnam in 1986, which included among others the elimination of the cooperatives' monopoly and encouragement of privatization and market liberalization and enhanced global trade. Since then many households have decided to separate from the cooperative and to privately invest in aluminum and metal melting for household livelihood. Villagers also began the more profitable enterprise of melting scrap aluminum and produce bars for factories, plants and for export, instead of making pans for the domestic market that was the practice prior to *Doi Moi* period. In the last five years, Man Xa has expanded its markets of recycled aluminum to China. Today the village produces 400 to 500 tons of aluminum bars, from 8000 tons of aluminum scraps.

Aluminum production process starts with the purchase and classification of aluminum scraps. After sorting out and preliminary treatment, materials are melted in primary pots. They are then placed in primary moulds to make semifinished products, in the form of bars that are used as inputs for other forms of aluminum production. Slag formed at this stage still contains aluminum and thus moved into filtering tanks. This is later used as input for the melting process in the primary pot in order to make full use of the material.

After being melted in the primary pot, the aluminum can be continuously melted in the secondary pot. This is then moved to the next stage where products are refined. Slag formed in the process of melting in the secondary pot is waste and not reused. In household-based aluminum recycling three production processes involved – that is, washing of aluminum scrap material, filtering, and cleansing of finished products -- create waste water (aside from solid waste). A large volume of toxic gas is also formed and dispersed to the surrounding environment.

Households in Man Xa village have no access to the piped water. Local people rely on water from drilled wells or rain water for drinking and domestic use. This is now under serious threat of pollution since the intensification of household-based aluminum production. Based on water samples collected from both drilled wells and collected rain water current status of the quality of water used for drinking and daily activities exhibit the following characteristics: (1) iron concentration in the two drilled well water samples are three to eight times higher than the standard level for drinking water; (2) samples of drilled well water are polluted with oil and concentration in one of the two exceeds the standard levels; (3) ionized ammonium concentration is high not only in the underground water but also in the rain water, exceeding the standard level for drinking water.[5]; (4) and biochemical oxygen demand (BOD) concentration in all the water samples is higher, 3-5 times exceeding the standard levels.

Furthermore, during the rainy season, aluminum concentration in the rainwater of households that are not involved at all in aluminum melting is quite high (0.9mg/l), exceeding the permissible limits for potable water (0.5mg/l). Aluminum dusts created during the manufacturing process scatter and fall onto the house roofs, eventually draining into the rain water tank.

Quality of water on rice paddy and irrigation canals has also deteriorated. Based on samples collected during the rainy season, water contains some heavy metal concentrations (like zinc, lead, and mercury). On the other hand, Ngu Huyen Khue River is heavily polluted at certain points in the village. Concentrations of BOD, ionized ammonium, and lead exceed the permissible level. During the dry season, the BOD concentration exceeds the permissible level though not much (16.5mg/l compared with the standard level of 10mg/l). However, during the rainy season, the BOD concentration increases dramatically in both river water samples – four times higher than the standard for natural water bodies, despite the river current being stronger. This is because the river also passes other artisanal villages upstream collecting their untreated wastewater. Further, village sewage ponds that used to be ponds for agricultural purposes and daily activities are also now seriously polluted. The metal concentrations exceed the permissible level stipulated for natural water bodies.

Man Xa's rapid development of craft industry, including associated demographic growth, and the absence thus far of solutions to effectively abate water pollution have combined to make the level of environmental pollution in the village a health hazard. All wastewater receiving water bodies are polluted at an alarming rate, thus posing risks to the environment and to local villagers' health.

Based on a survey of 80 households in Man Xa in 2006, majority of the rich, upper-middle and the middle households claim not to have any health problem at all. A minority of these groups and all in the poor group however admit to

[5] Contrary to common practice in the area, rainwater thus needs treatment before use.

suffering from having a cold and respiratory problems. Inspection of the Van Mon's Health Clinic's records show a contrary picture however. Man Xa villagers' visits to the health clinic have been increasing annually. The number of death due to cancer has also increased annually for the last 4 years. (based on interviews with the head of Van Mon's health clinic). According to public health specialists, polluted water is the main reason that causes stomach and intestinal cancer. Further, the number of those who died of cancer and of those who contracted other diseases in Van Mon was between 2 and 3 times higher compared to the number in other communes in the district that are not engaged in artisanal activities[6].

The rise and intensification of household-based artisanal craft presents a serious governance problem for the authorities in peri-urban Hanoi. There is clearly an environment/health and livelihood trade-off implicated. Today local commune and other authorities are in conflict with local households on how to manage water quality deterioration and associated health problems in these villages without prejudicing what has become a very important new source of livelihood.

III. Implications for water management

In Sam Ruaen and Van Mon, changes in livelihood activities have put new pressures on resources – especially, on water – that are beyond the reach of functional environmental management regimes commonly found in the per-urban (McGranahan, Satterthwaite and Tacoli 2004). The two situations exemplify how lack of clarity of institutional responsibilities common in the peri-urban generates a tendency by government agencies to operate either sectorally or within the narrowly defined remits, or, perhaps to just dispose pollution and waste outside the administrative boundaries where they are generated (Davila 2006; Dahiya 2003).

These new livelihood activities and changes in water use highlight the importance of holistic planning and effective integrated management scoped in the peri-urban, which ironically is not in the planning and management tradition of the peri-urban at all (Simon et al 2006; Allen 2006). Addressing the complexity of associated problems would also entail putting in place an integrated water resource management (IWRM) sufficiently scoping the peri-urban interface. A holistic and system wide management approach that aligns, among others, water quality and quantity, surface water and ground water, upstream and downstream water-related interests, and land-use and water management (Ahsan & Das Guta, 1999; Braga 2001; Calder, 2005; Carter, Kreutzwizer, & Loe, 2004)).

In more specific terms, three important dimensions of water governance problems typical in the peri-urban of Thailand and Vietnam are implicated in the Sam Ruaen and Van Mon cases.

First. *Single-focus traditional water management*. In the Sam Ruaen, Pang Pa Canal is under the direct responsibility of the Royal Irrigation Department (RID), whose traditional focus is on managing water quantity for irrigation allocation and control of canal flooding. In Thailand, it is still the RID that is entrusted with the duty to oversee and administer water in the peri-urban area. But despite expansion of its mandate to include solving water pollution (in addition to water allocation and flood control) such remains under-operationalized and in practice, merely an incidental concern of this traditionally water allocation body (Sajor and Ongsakul 2007). On the other hand, Van Mon situation demonstrates the patent disconnect between micro-level land use on the one hand, and water use and management, on the other. Water-using manufacture has been allowed to co-exist in the same narrow physical space being used for residential and farming

[6] This is based on the author's Yen Phong District's Health Center records.

purposes. This de-facto mix-up of uses with disastrous environmental and health consequences is a manifestation of failure of water sector and land sector agencies, among others, to co-ordinate and integrate their separate particular mandates in given localities to manage water, land, and the general environment.

Second. *Institutional constraint in local trans-boundary water quality problem.* The conflict over water quality currently raging in Bang Pa Canal highlights the cross sub-district nature of local water management. As mentioned earlier, pollution coming from livestock farms in neighboring subdistrict of Don Sai (and, to a certain extent, Pikulthong) has jeopardized ornamental fish farming in Sam Ruaen.[7] This particular pollution problem needs inter-subdistrict (and perhaps, inter-district) conflict resolution measures and mechanism, and common local trans-boundary planning and cooperation, a governance modality that calls for innovation and thinking outside the box. The same local trans-boundary problem besets the riparian village of Man Xa and other villages along the Ngu Huyen Khue River. As earlier mentioned, waste discharges of artisanal activities in upstream communes along the river has further worsened the quality of river water in Van Mon commune, already being polluted by its own villages. This of course has affected the general usability of the river water for irrigation of local paddies. Similar to Thailand, Vietnam lacks horizontal linkages between local territorial administrative bodies that can effectively address local trans-boundary problems (Sajor and Thu 2009).

Third. *Failure to regulate spatially diffused small and household firms' pollution*. Peri-urban villages are sites of robust development of small and household firms' production, especially in the context of these areas enhanced linkages with urban center and international market. In Muang district, small livestock farms have been flourishing, co-simultaneously with the household-based ornamental fish farming. Though in varying degrees, both are polluters of canal water and groundwater. The two however are also in a contradictory relationship vis-à-vis the issue of appropriate water quality required by their specific production activity. On the other hand, in Van Mon, household-based aluminum melting has become the new non- traditional users of water and new agents of pollution of local water bodies. In both countries, regulatory tools and standards to curb wastewater discharges, and enforcement capacity hardly exist to effectively regulate pollution by small and household –based industries. Effective control of the government in this particular industry sector becomes even more challenging due to the spatially dispersed and informal characteristics of these of firms.

Conclusions

The above narratives of Sam Ruaen and Van Mon and discussions on their implications on water management have shown how diversification of household economic activities in the context of enhanced global links of the peri-urban reconfigures pre-existing local water use and associated appropriate quality standard. New water-using entrepreneurial activities of village households create new demand for an appropriate quality of water in irrigation canal as in the case of Sam Ruaen and/or generates new water pollution source that degrades existing irrigation and river bodies as in the case of Van Mon, which jeopardizes traditional uses of these water bodies. Existing water- and land-related institutions in Thailand and Vietnam, which have remained single-focused, administratively fragmented and territorially bounded, and lacking in tools and

[7] On the other hand, since ornamental fish farming also discharges pollutants in the canal, it can be assumed that this new activity has water degradation implications in canal and ground water whose impact is likely in the neighboring or downstream sub-districts. This matter though was not investigated by the field research of this case study.

capacity for regulating dispersed household based production, are practically inutile in managing water and environment in the midst of this development.

These discussions and findings open up another important dimension in the emerging literature of water and peri-urban of Southeast Asia. Though still few, emerging studies have highlighted how conversion of land for urban use, 'rolling over' or encroachment of the urban development into rural land have physically transformed existing local water bodies and have resulted to degradation of local water and associated conflicts. On the other hand, what I have specifically focused on is how degradation and conflict in water quality can come about not only as a result of spatial encroachment or spatial juxtaposition of the rural and the urban, but through the dynamics of social and economic transformations of households that reconstitute them as new users of water serving their entrepreneurial activity in the process of livelihoods diversification. New contestations over water quality arise because of new uses of water and new requirements of water quality that may be incompatible with and threatening to pre-existing or traditional uses of water and dominant quality standard.

Holistic water management in the growing peri-urban of Thailand and Vietnam, and in more or less similar other countries in developing regions, need to address co-simultaneously impacts on water supply, quality, and associated conflicts arising from both spatial and social transformations currently unfolding in urban-rural interface. These transformations would become even more robust and gather stronger momentum as these areas become linked to globalizing forces, most especially with the international market. There is a need for a distinct peri-urban perspective in water management in the large in-between areas beyond the city core and before the rural hinterlands. In rapidly urbanizing countries such as Thailand and Vietnam, this is imperative.

A peri-urban perspective in water management necessarily has to put as its central agenda the task of addressing not only water quantity allocation issues, but water quality problems as well; and, the task of addressing not only macro-national scale trans-boundary water issues, but more importantly local trans-boundary water conflicts. And last but not least, peri-urban water management has to tackle the difficult and complex trade-offs between livelihoods and environment/health, at the household and village community, the scale where these concerns matter most.

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Payment for Environmental Service: An Introductory Note in the Mekong Context

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I. Introduction

Today, global recognition of an economic approach to environmental management is increasing in all sectors of the economy. Payments for environmental services (PES) have consequently emerged as a concept and tool for achieving ecosystem conservation, and at the same time improving the livelihoods of environmental-service providers. As a new innovative approach, however, not only the definition of PES is not yet formalized, but also the schemes of PES are great variable. Those made some confusion in research and practice. This short note is aimed to promote the understanding of PES through an introduction of the basic conception of PES and PES schemes in the context of Mekong region as well as its debates. It concluded by addressing the key points links to water allocation.

II. PES: Definition and Terminology

The idea of PES is to provide incentives and benefits for people who now utilize environmentally valuable ecosystems in return for them agreeing to utilize them in such a way as to protect or enhance their environmental services for the benefit of a wider population (van Noordwiik, et al, 2004). However, until now, no formalized definition of PES schemes exists in the literature, which causes some conceptual confusion. The most widely accepted definition provided by Wunder (2005) that based on five principals: [PES is]

- a voluntary transaction where
- a well defined ES (or a land-use likely to secure that service)

- is being ‘bought’ by a (minimum one) ES buyer
- from a (minimum one) ES provider
- if and only if the ES provider secures ES provision (conditionality)

Based on this definition, PES features contrast with those of some other conservation approaches. PES is generally more direct than approaches like Integrated Conservation and Development Project (ICDPs)-which aim to indirectly promote conservation and explicitly combine conservation and development goals (Wunder, 2005)-or communicative instruments, which use communication to advocate certain types of environmentally positive behavior. PES is also generally more flexible than approach such as command-and-control systems or other protected area schemes (Leimona and Lee, 2008).

Furthermore, van Noordwijk, (et al. 2007) has redefined the PES criteria in order to highlights the aspect of pro-poor as the environmental service provider who might be the prioritized group to receive the payment. According to them,

PES need to be realistic, voluntary, conditional and pro-poor:

- *Realistic:* PES schemes relate to real impacts on tangible environmental services of importance to at least some stakeholders
- *Voluntary:* PES agreements are not fully imposed, but leave space for innovations and search for increased efficiency through voluntary agreements in the space between ‘willingness to pay’ and ‘willingness to accept’
- *Conditional:* PES schemes include conditions for the rewards to relate to the actual achievement of goals and standards
- *Pro-poor:* PES schemes involve all stakeholders in the landscape, avoid increasing inequity or actively enhance equity on gender and/or wealth basis.

Within the below understanding of PES features, various terms used for the remuneration of environmental services is would be get better and clearly understood.

Payment for ES*:* the most widely used term. But, it is clear monetary associated in contrary to option of in-kind payment (Wunder, 2005)

Markets for ES*:* also generally used term, particularly by IIED. It highlights not only economic incentives, but also competitive market mechanisms. (Landell-Mills and Porras, 2002)

Reward for ES*:* it commonly knows as Rewarding Upland Poor for Environmental Service they provide (RUPES). This ICRAF initiative is looking for justice for service providers being secured rewarded. (van Noordwijk, et al. 2004). Also, it has been called as compensation of ES, especially in Chinese context (Lu, et al. 2008).

III. PES situated in the Mekong

In the context of Mekong region, also worldwide, forest provide four types of environmental goods and services to be sold. They are 1) protection of landscape beauty, 2) carbon sequestration and storage, 3) biodiversity conservation and, 4) watershed protection. Meanwhile, there are also government-led and market-oriented schemes for PES in the region. This section reviews the examples of how those four ES has been traded in Mekong and simultaneously address the role of government and market.

Payment for Carbon Offsets(PCO): Payment for Carbon offsets is the way that buyer to get carbon emission credit from providers, for example northern electricity companies paying tropical farmers to plant or maintain additional trees. The payment schemes are under CDM (Clear Development Mechanisms) in Kyoto Protocol.

In the Mekong region, to our knowledge, China and Vietnam are the most countries get involved. In Yunnan, China, the afforestation CDM project is funded by Conservation International (CI) and The Nature Conservancy (TNC). They are successfully sold the carbon emission to Europe Carbon Fund and 3M company. In Vietnam, the state afforestation program is applying for Carbon finance from international carbon market.

More recently, with the increasing critiques on the gaps of CDM in protecting the existing tropical forest, where deforestation and peatland loss cause 20% carbon emission, an new initiatives called Reduced Emission from Deforestation and Forest Degradation (REDD) emerged at global level. The basic idea is to sell carbon storage from forest. In the region, Laos and Vietnam are actively engaged in this initiative.

However, neither existing project under CDM nor REDD schemes get smallholder farmers involved. The Initiators are apt to put those target projects in the state-owned forest land to avoid tenure conflict issues on the one hand, and reduce transaction cost in operation on the other. Also, the most carbon trading systems set up in developed countries is too sophisticated that might eliminate the participation from developing countries.

Payment for Watershed Protection (PWP): The common practice for Payment for Watershed Protection is that downstream water users paying upstream farmers for adopting land use that limit soil erosion or flooding risks. Also, the types of PWP is varies from government-led mechanism to private sector or multi-stakeholders interaction.

In the Mekong context, the case of PWP is greatest among four of those ES traded. To our knowledge, China, Vietnam and Thailand have been implementing the largest scale PWP in the region. In China, the Sloping Land Conversion Program (SLCP) is largest PES schemes that financed by central government to convert agriculture land to forest at upstream of Yangtze and Yellow Rive. It aimed to protect the upstream watershed after the 1998 catastrophic floods. Farmers received subsidies and seedlings from government for that land use change. In Vietnam, state launched “Government Watershed management contracts” to protect the upstream watershed. Also, Thai government invests to set up watershed protection zone in Chiang Mai. On the other hand, there are also a number of small scale PWPs. For example, the hydrological company in Yunnan and Thailand invest considerable fund for upstream afforestation and payment of local communities to protect the forest.

In practice, the most payment schemes for environmental services in Mekong region have been publicly financed. Those programs have few considerations about poverty of upstream communities on the one hand, the investment from government is insecure in a longer term on the other.

Payment for Biodiversity Conservation (PBC): there are various ways for PBC. For instance, the conservation donors paying landholders for creating set-aide areas for biological corridors, or government may pay indigenous community for restricting their resource use in the protected area.

In the context of Mekong region, the largest scale PBC is funded by Asian Development Bank (ADB) to set up Biodiversity Corridors in Great Mekong Subregion (GMS). In that project, they have aslo budget a great amount for local community who live in the corridors. The program is across all the countries in the region, Yunnan (China), Vietnam, Laos, Thailand, Myanmar and Cambodia. In addition, Internationally, Vietnam and Laos have International Cooperative Biodiversity Group (ICBG) work for Biodiversity Access rights. At the national level, for instance, China government established a fund to pay the local farmers whose forests were delineated as Ecological Forest for protection. However, the payment is too small to cover the opportunists cost of farmer.

For PBC, there are comparatively few private sector involved. Rather, government and international organization as well as donor agency are playing the predominated position to promote and act in PBC.

Payments for Landscape Beauty (PLB): The PLB is normally operated as tourism operators paying a local community not to exploit resource in a zone used for tourism (e.g. no hurting in a wildlife viewing, no logging in national park etc.). The PLB is most payment scheme that market mechanism applied among four types of traded ES.

In the Mekong region, a number of examples adopted PLB. In Thailand, the Kancanaburi Ecotourism Cooperative Company operates ecotourism service to finance the protection of landscape. In Yunnan, Tiger Leaping Gorge is operated by private sector that charge the tourists for access permit. National Park in Laos, Vietnam and Cambodia also practices in one way or another to entitle the access right to tourists. However, the most commercialized PLB has rarely maintain as real ecotourism, as the booming of tourism market. That lead to degradation of resource in some case. Also, in some cases, the powerless local community is hardly to receive a fair payment.

To sum up, four types of environmental goods could be sold separately as well as integratively. For instance, National Ecological Benefits Compensation Fund in China is the case bundled all environmental service. Furthermore, the multi-stakeholders' engagement has enrich various schemes. Government, company and donor agency play as the role of buyer, while NGOs play actively as intermediate to bridge buyer and providers. However, in practice, local community's input in design and implementation of PES as well as full autonomy in participation choice need to be further enhanced.

IV. PES in Debates

While the global increasing interests on PES, its debates also emerged to question how PES can better contribute to poverty reduction and environmental conservation. Three major contradictions exist:

Fairness vs. Efficiency: Wunder (2002) has stated the significance to consider fairness and efficiency. He augured "…many look PES as a source of just reward for poor rural people who take care of the environment and continuously produce environmental services. But from an efficiency point of view, only those who constitute a credible threat to service provisions or are likely to actively increase provision should be paid. Schemes for PES face intrinsic contradictions, having to balance ES additionality and financial efficiency goals with fairness and stewardship-reward considerations." Moreover, in conservation and rural development circles, what aspects (poverty or protection) would be prioritized for a PES schemes designs also become a hot issue to think over.

Government v.s. Market: Government v.s. Market is long debates as "governmental failure" versus "Market failure" in Neo-classical economic viewpoint. On the one hand, the inefficient bureaucracies and high cost of coordination in government sector hamper the goal of PES. Also, financial durability of government is an issue for investing long-term PES schemes. The overruling of government might also turn a *Voluntary* PES schemes into a Command-and-control and PES-liked schemes. On the other hand, leaving decisions to market might lead to undervalue ES and marginalize pro-poor community. Thus, the critical issues is how to balance the role of government and market to use various economic instrument (e.g. tax, bond, green funds and fees etc.) for PES.

Rights and Power: it is widely acknowledged that secured land ownership is precondition for PES. The property right enables the poor people to be defined as provider for participating into PES schemes. However, the right does not ensure the subsequent and reasonable payment. Considerable case shows powerless poor farmer is positioning in a marginal place for negotiating agreement of PES. As a result, undervaluation of PES and overrestricted resource access are the most case took place. Moreover, many poor community (e.g. ethnic group in Thailand) only hold the customary use right over the land and forest that may extremely prevent them from participating in PES schemes. The powerful elite may take hold of the land and marginalize the poor, if PES projects increase the value of the land and incentive to take control of it. Rights do not guarantee the benefit distribution. But, right is the precondition for PES. How to *transform right in real power* for control over land and negotiate with buyers is the very issue in the debates.

V. Concluding Remarks: PES towards Water Allocation

PES is an innovative approach toward conservation and development. Although the critical debates existing, the promising future of PES is also predictable. To link with PN 67 project on water allocation, this concluding remark address key point for consideration in the project:

1. Strengthen information sharing: information is power. It is crucial to sharing information related to ES among the stakeholder involved in water allocation. Enhancement of information sharing could improve poor people's ability to participate in emerging market, strengthen their bargaining power in market creation and schemes designs, as well as availability for negotiation of environmental payment.

2. Invest in training and education: since lack of awareness on PES, training for market creation, negotiation, management, financial accounting, contract formulation, and conflict resolution will all tend to be important. Technical sills relating to the delivery of environmental services will also be needed. Besides, this initiative also serve as key activities for raising awareness about wide range of stakeholders in this respect, particularly government sectors.

3. Clearly and quantitatively cost-benefit analysis: Clear cost and benefit analysis for environmental service provided is the key information for market creation and PES schemes designing. In particular, a quantitative analysis on cost of providers is significant for negotiation and contract design. It is also fundamental data to avoid exploitation of poor farmer and improve fairness.

4. Security of Property Rights: formulation of natural resource property rights is essential in order to give poor households control over, and rights to benefit from ES they provide in the long run.

5. Social space for multi-stakeholders to negotiate and participate: A social space is important in order to facilitate negotiation, bargaining, and participation about improving recent payment schemes. However, at present, the limited participation by both local governments and residents in the design of payment schemes has impaired their willingness to pay; and, on the other hand, monitoring and evaluation by the tertiary sector is lacking in current policy implementation.

6. Good governance and a cooperative institution: For sustainable management of natural resources to guarantee environmental services can be provided and improved continuously and improvement of policy design and implementation to ensure environmental payment can be made constantly and fairly, a cooperative institution is needed to manage both sectors. This institution should be established through participation with multi-stakeholders. The institution should be transparent, accountable, responsive, equitable, and efficient in policy design and implementation.

VI. Acknowledgements

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VII. Further reading

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Decision making in the Mekong: What role for scientists?

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Abstract

The allocation of the Mekong River's 450 billion cubic metre annual flow is being contested by those who see the river primarily as source for hydropower and irrigation and those who believe its natural flow must be preserved to sustain the livelihoods of the 'millions of people' who depend on its 'life-giving' waters. Escalating demand for renewable energy is likely to result in new dams being built – and opposed – on the mainstream in the years ahead. This paper examines the challenges facing scientists at this critical juncture. It argues that, given the vastly different perspectives on the use of the river, there is a high risk of scientific research on the biophysical and social impacts of development being either ignored or distorted to serve the interests of either those in favour or opposed to dams. It examines the very different contexts that scientists have to operate in, most of which are not conducive to objective, scientific research and the unbiased use of results by decision makers. It raises questions about the extent to which the scientific community can objectively answer the key question of how much 'development space' exists for new infrastructure development on the Mekong. The paper describes recent initiatives in the region that demonstrate that research on flow allocations can be done in a highly participatory and transparent manner. In such contexts there may be some hope for scientific research to form the basis for decision making on flow allocations. The paper ends by suggesting that scientists should assess the ethical opportunities and threats involved in social impact assessment contracts before undertaking research.

1. Introduction: Contested Visions of the Mekong

1.1 The Pro-Development Perspective

The Mekong River, with an annual discharge of 450 billion cubic metres and a floodplain of over 77,000 square kilometres, is the largest in Southeast Asia. Along its course it drops nearly 5,000 metres from its source on the Tibetan Plateau before reaching the Delta about 4,800 km downstream. With an average discharge of 14,500 cubic metres per second (MRC, 2005) there is little wonder that the river has long been viewed as a potential source of hydropower. Fifty years ago the first plans were drawn up to use the Mekong river's waters for power, with seven large mainstream dams proposed that would have generated over four times the amount of power required at the time for Thailand. Until the mid 1990s, when China started work on a cascade of mainstream dams, the river's hydropower potential, estimated to be some 30,000 MW (MRC, 2008), remained largely undeveloped. Saved in part by the turbulent history of South East Asia, the lower Mekong remains one of the few major rivers in the world that is not fragmented by dams and retains much of its natural flow. However, the region's new found political stability, economic liberalisation and rapid growth is likely to change this: once again riparian states are drawing up plans to use the Mekong mainstream as a source of hydropower, and increasingly these plans are being presented as an environmentally-friendly 'green' energy solution. Decisions made in the next few years are likely to have significant and irreversible implications for the flow of the river and for the millions of livelihoods that depend on it.

The economic viability of the dams is underpinned by escalating demand. The electricity demands of Yunnan Province (China) and from the other riparian states have been forecast to grow nearly five fold, from 26,000 MW of peak demand in 2000 to over 102,000 MW in 2020, with almost half of this demand coming from Thailand and approximately one third from Vietnam (Norconsult, 2003). In China two dams have already been completed that form part of a cascade that will exploit an 800-m drop over a 750-km stretch of river to generate 29,000 MW. Enthusiasm for hydropower in China is high as river flow is seen as a source of "clean" power for eastern China where dependence on coal-fired power stations has resulted in dangerously high levels of pollution (Dore, 2007).

The Mekong has a highly seasonal flood pulse with dry season flows being as little as 6% percent of the wet season peak (MRC, 2008). However this flow pattern is set to change, as the release of stored water from upstream dams during the season will increase low season flows (once dams have filled), augmenting the viability of run-of-river hydropower dams. The combination of increased low-season flows, growing demand, rising energy prices and private sector interest is resulting in something of a "river rush" on the mainstream of the Mekong (Terra, 2007). Now all riparian states have plans to tap into the Mekong and its tributaries, with over 200 new dams, including 11 on the mainstream being planned (MRC, 2009). However, it is not just power companies who are eyeing the waters of the Mekong. Large-scale water diversion schemes are also reaching an advanced stage, including a plan to divert 2 billion cubic metres of the Ngum River in Laos to Northeastern Thailand via a 17-km tunnel under the Mekong (Bangkok Post, 19 July 2008).

Those in favour of tapping the Mekong's hydropower and irrigation potential tend to promote this as a form of "sustainable development", a term frequently used by the Asian Development Bank (ADB) in the context of its Greater Mekong Sub-Region (GMS) Programme (www.adb.org/GMS/strategy.asp). The ADB, in collaboration with the World Bank, argues the Basin's "flexibility and tolerance" will allow for "sustainable, integrated management and development (that) can lead to wide-spread benefits" (World Bank/ADB, 2006). The mood in the pro-development camp is bullish, with both banks suggesting that there is a need to move from the "more precautionary approach of the past decade" as this tended to avoid risk "at the expense of stifling investments" (World Bank/ADB, 2006).

A key theme that emerges from the banks, and other organisations in favour of Mekong development, is that of 'trade-offs' resulting in 'win-win' situations. Both banks call for new policies to support decision makers in assessing the economic, environmental and social trade-offs that will emerge when water use is changed and when communities dependent on aquatic resources find their livelihoods at risk (World Bank/ADB, 2006). This is a clear recognition that there may be winners and losers emerging from the proposed risk taking. However, the overall belief in win-win outcomes appears to dominate the pro-development discourse, to the point that the protagonists suggest that any losers in the trade-offs game can be accommodated through compensation and mitigation measures, implying that the win-win scenario will eventually prevail.

The unabated enthusiasm for large-scale dams and water diversion projects suggests that the 'hydraulic mission' of the riparian states of the Mekong is far from being filled. Fulfilling this mission is seen, by many, as paramount to the achievement of national goals and, therefore, as matter not just of poverty reduction but of 'national security', an attitude that many in Southern Africa will recognize from the recent past (Turton, 2005). Those seeking to further their nation's hydraulic mission see ample opportunity for new infrastructure, and are convinced that any negative impacts associated with reduced river flows can easily be managed.

1.2 The Alternative View

Enthusiasm for large-scale infrastructure is far from universal. Throughout the region there are indications of dissent, with the opposition ranging from being well organised and open in Thailand to *ad hoc*, weak and often covert elsewhere (Guan, n.d). From these quarters a very different view has emerged over the years for the future of the river. They believe that dams will soon push the ecosystem to a "point of no return", with local people paying an unacceptable price for someone else's development (Watershed, 2002). For the anti-dam camp the maintenance of natural river flows is seen as vital to the Basin's ecosystem in general, its fisheries in particular, as was well a myriad river 'goods and services' that are maintained by the annual flood pulse.

The argument of those opposed to large dams on the Mekong rests on a number of key points, one of which is the river's hydrology. The International Rivers Network (IRN) argues that the pro-development camp - and in particular ADB and the World Bank – is misrepresenting the Mekong's hydrology. They accuse the Banks of "massive over simplification" and of ignoring the range of flows in the dry and wet seasons. More critically IRN claims that the Banks completely ignore the changes that will occur in river ecology as a result of changes in sediment, flood pulse, flood plain inundation, water quality, and blockages to fish migration.

A second key point of contention is that of river ownership. While the pro-development camp focuses on *national or regional level* benefits, the anti-development camp is largely concerned about the impacts on *local people*, especially on those who make greatest use of aquatic resources to sustain their livelihoods. The latter see the riparian residents and resource users as the true *owners* of the river, not the national governments or river basin organisations. They believe that the fundamental decisions about the Mekong's future should be made by those who will be most directly impacted, rather than by the beneficiaries of hydropower or large irrigation schemes, who are likely to live many miles away. The two positions represent a clash of perceived rights: the right of Governments to pursue national developments for the 'greater good' and the right of local communities to sustain their livelihoods on common resources used for generations.

A third critical difference has to do with the effectiveness of mitigation and compensation measures. While the pro-development camp tends to presents an optimistic (although vague) view of the effectiveness of such measures, their opponents note that there is very little evidence of impacted households ever being able to fully recover - let alone improve - their standards of living. The key failures noted in compensation plans are that they are overly ambitious, inadequately appraised, inappropriate to local needs, and based on unjustified assumptions about new technologies, such as fish ladders to facilitate migration and rabbit farming to replace lost protein (Blake, 2005).

A fourth and very fundamental difference has to do with public participation and community consultation. Those opposed to dams generally claim that the developers make major decisions on the basis of very limited involvement of impacted people, with most workshops being held late in the process and being far removed from the people most likely to suffer.

They further accuse developers of extracting information from local people rather than truly involving them in decision making.

1.3 Pressure on Scientists

Within this contested context, social scientists are under pressure to generate results that can – *at least ostensibly* – be used to guide decision making on future river flows. Research on the impact of dams and other built structures on flow is being carried out in many locations and levels across the Basin, but in vastly different contexts. It ranges from strategic assessments of the cumulative impacts of changed flows ranges, using basin-wide models and predictive tools (Sarkkula *et al*, 2007), to myriad case studies on local livelihoods. In the next section we examine these contexts in more depth and look at how the attitudes of decision makers varies within these.

2. Decision Makers' Attitudes to Scientific Research in the Mekong

Broadly speaking, for scientific research to have any impact on water resource management decisions the circumstances have to particularly favourable. In most contexts they are not. In this section different attitudes or responses of government officials towards scientific research are identified through five case studies. In the next section a series of other factors limiting scientists' influence on water resource management decision making in the Mekong is explored.

2.1 Tasang Dam, Burma: Ignore science, pursue the "development" agenda

There are circumstances in the Mekong where scientists are highly unlikely to have any influence on decisions regarding river flow, notably in cases where totalitarian regimes have set hydropower development as a national priority to be pursued at virtually all costs. A clear example of this is the Tasang Dam in Burma on the Nu/Salween River, where three quarters of the 3,300 MW generated will be exported to Thailand. Although the 228m structure will create a reservoir 670kms long, inundating an area rich in biodiversity and unique species, the detailed design is being done without an Environmental Impact Assessment (EIA). Questions that are being raised by international organisations about the safety of the dam in an earthquake-prone area and about its social impacts and economic viability remain largely unanswered (Wong *et al.,* 2007). The 13 ethnic minorities living in the catchment have never been given an opportunity to express their views. The ruling junta's position appears to be 'consistent', at least in terms of stemming any opposition to the dam: "The military junta's record on this issue is consistent. They will abuse or kill anyone who dissents" (Sai Win Pay, elected and exiled Member of Parliament from Shan State, 2000, quoted in www.burmainfo.org/eri/FatallyFlawed.pdf).

2.2 Yali Falls, Vietnam: Superficial science covering conflicts of interest

In other situations a country (or a developer) wants to be seen to be doing the right thing, but does not want to risk dam construction or flow allocations being changed by any research results. This attitude results in superficial 'science', with EIAs and other research being done unprofessionally, without community consultation, public scrutiny or peer review. One example of this is the series of EIAs involving the Yali Falls Dam on the Sesan River Basin in the Central Highlands of Vietnam, about 70 kilometres upstream of the Cambodian border. The first EIA was conducted in 1985 by SWECO, a Swedish engineering company with an environmental wing. It claimed that the impacts of the dam on would be "negligible" given the "sparsely populated" area downstream (Wyatt and Bird, 2007). Perhaps this conclusion was reached because, for some reason, the downstream study area was confined to an area 8 km long and 1 km wide. As a result, transboundary impacts on Cambodia were not considered at all. A subsequent EIA, conducted by Electrowatt in 1993, did little to change the impression of negligible impacts. On the basis of the two EIAs construction of the 720 MW dam began in 1996.

As construction and then operation (2000) of the dam got underway the impacts proved to be far from negligible. According to International Rivers Network: "At least 36 people have drowned due to erratic releases of water from the dam; at least 55,000 people have been adversely affected; they have suffered millions of dollars in damages due to lost rice production, drowned livestock, lost fishing income… and houses. In addition, there has been an increase in river sedimentation and erosion, destroying river-bank vegetable gardens;

hundreds of people have suffered stomach ailments, eye infections and skin rashes, which they believe are related to changes in the river's water quality since the dam was built." (IRN, 2002). Even if these reports are in any way exaggerated it is quite apparent that significant impacts occurred as a result of the dam, for beyond anything anticipated by SWECO or Electrowatt. Despite SWECO's estimates of the likely impacts being so far off the mark – or possibly *because* of this – the company continued to work closely with Electricity of Vietnam (EVN) on several hydropower assignments in Vietnam, including the design of the Se San 3 dam downstream of Yali Falls.

With mounting concerns being raised about the impacts these dams on communities downstream in Cambodia the ADB commissioned an assessment of Se San 3. The study, carried out be Worley Consultants from Australia, was never officially released by the ADB because of objections from Vietnam. However, through a leaked copy its contents have become well known. Worley describes SWECO's analysis of Se San 3 impacts as "bad science", with "unrealistic assumptions", arguing that: "It does not represent a sound basin wide strategy for using water or other resources, and will lead to serious conflicts between water users within the basin ...A wider and more scientific analysis, less dedicated to a single site and, dare one say, *future consultant engineering work*," is needed" (Worely, quoted in Probe International Briefing, October 2003, emphasis added).

Again, possibly because of its superficial analysis of impacts, in 2005 SOWECO was chosen by the Government of Vietnam to conduct an assessment of the transboundary impacts of changed flows in the Se San basin *despite objections from Cambodia* (Wyatt and Bird, 2007) and to do an EIA of hydropower impacts on the neighbouring Srepok River. The former has never been released while that later has been described as "an incomplete assessment and therefore inadequate as a basis either for investment decision making or for planning mitigation and compensation with dam affected communities in Cambodia" (Probe International, 2007). In short, SWECO's involvement in EIAs and flow allocation assessments, while also being involved in dam construction and energy master planning in Vietnam, represents a massive conflict of interest. The outcome is superficial science the results of which can easily be manipulated by decision makers.

2.3 Theun Hinboun Hydropower Project, Lao PDR: Withhold the results

As noted above, when scientists are hired as consultants to undertake flow allocation assessments, they are very likely to be under pressure from the developer (dam owners/operators) to produce favourable results, or risk not being employed again. When the results generated are *not* favourable to the developer, it is not unusual for them to simply withhold the report, as was the case with the Worley report. Another example of this emerges from the case of the Theun Hinboun Hydropower Project (THHP) in Laos, (owned 60% by the Government of Laos) which diverts water from the Theun-Kading River, through a tunnel into the Hai and Hinboun Rivers. Before the project was completed in 1998 the ADB claimed it would be environmentally benign and would not impact people's livelihoods. However, when the International Rivers Network (IRN) reported that all villages downstream had experienced a loss of fisheries, the ADB called for further study. A fisheries expert, Terry Warren, was approved and undertook a detailed assessment of impacts. Because the report was mildly critical of the project, both the ADB and the Theun Hinboun Hydropower Company simply refused to release it. Public disclosure of the findings only came about when Warren released the results himself, via the IRN website (Fisher, 2008).

2.4 Pak Mun Dam, Thailand: Commission multiple research efforts, ignore the results

In some contexts the government might be under considerable pressure to allow independent research to be conducted. However, in order to avoid an outcome that might be detrimental to the realisation of the proposed development, the government supports more than one assessment, and then ignores the key research findings and the recommendations of its own committee. A clear example of this is the decision- making process in the case of the Pak Mun Dam in 2002 in Northeastern Thailand, which shows an interesting mix of decision makers tempting to respond to scientific findings, popular protest and political power at the same time.

The Pak Mun was commissioned in 1994 by the Electricity Generation Authority of Thailand (EGAT) as a run-of-river hydropower dam. It is located 5.5km west of the Mun River confluence with the Mekong and has a 17m high wall with a 60km^2 reservoir. Its original design was modified to limit resettlement from 4,000 to 248 households. Considering the size of the Pak Mun, and the fact that it was redesigned to accommodate social and environmental concerns, it has sparked a considerable amount of controversy. A key reason for this is that the 1983 Impact Study did not include a comprehensive assessment of fish species, or of how household access to fish might change after the construction of the dam. Instead, it presented highly optimistic estimates of the benefits that would be obtained from stocking the reservoir with fish and essentially ignored the likely impacts of lost fish habitats and migration routes (WCD, 2000).

From the start, local people opposed Pak Mun dam. The blasting of rapids below the wall had an immediate impact on their fisheries. Opposition to the dam gave birth to a powerful people's organisation, known as the Assembly of the Poor (AoP). The AoP, supported by many NGOs and academics, claimed that the commissioning of the dam (through closure of the gates) had harmed their livelihoods as it had prevented migration of fish from the Mekong and had inundated their riverbank gardens. The AoP used a variety of methods to pressurise successive Governments over a decade, eventually convincing the Government of Thaksin Shinawatra, which came to power in 2001, to negotiate (Kanokwan and Hall, 2009).

In 2001, the Thaksin Government agreed to re-examine the impacts of the dam with a view to considering whether or not to open the dam gates to allow free river flow. This resulted in the creation of various committees and a flurry of parallel scientific research efforts, none of which had any real impact on decision making. The chronology of events is informative as it demonstrates how the Government was able to give the impression of responding to people's concerns through scientific research, while systematically ignoring the research recommendations that it did not favour.

Based on the direct experience of one of the authors (Kanokwan) and interviews with another researcher directly involved (Tantuvanit), the chronology provides a rare glimpse into the 'black box' of decision making surrounding Pak Mun. It begins with Thaksin's appointment of a National Committee to examine AoP concerns:

March 24, 2001	The Thaksin Government appoints the National Committee on AoP's resolution (NCAP) to address 16 concerns raised by AoP, headed by the Deputy Prime Minister Pongpol Adireksarn.
April 9, 2001	NCAP appoints a Sub-Committee to focus on resolving the Pak Mun question headed by Dr. Chaiwat Satha-Ananad , a lecturer at Thamasart University.
April 17, 2001	Prime Minister Thaksin agrees to open the sluice gates of the Pak Mun Dam for four months to allow studies to be conducted on its social impact; this was later extended to thirteen months.
May 9, 2001	The Sub-Committee appoints a Steering Committee, headed by Dr. Suthy Prasartset, a lecturer at Chulalongkorn University, to focus on Restoration of Natural Resources and Livelihoods of affected communities.
May 20, 2002	Prime Minister Thaksin appoints another committee, headed by Deputy Prime Minister Chawalit Yongjaiyuth on Overseeing and Monitoring Pak Mun Resolution.
October, 2002	The Committee on Overseeing and Monitoring Pak Mun Resolution appoints sub-committee to work on screening research, headed by Dr. Suphavit Piamphongsant. He is chief inspector-general of the Science. This conducts detailed work screening research carried out by Tai Baan, Ubon Ratchathani University (UBU), Khon Kean University, the Office of Science and Technology (the later funded by EGAT) and 18 other research projects on the dam.

	Government ignores the roles of the sub-committee on screening research on Pak Mun and did not wait to see the report.
	The Government asks the National Statistical Office (NSO) to conduct a rapid survey. The NSO supports Prime Minister Thaksin's earlier decision to open the gates four months a year. This option is backed by EGAT, but opposed by academics and NGOs.
August 2002	The Committee on Overseeing and Monitoring Pak Mun Resolution invites researchers from all research projects to present their work at the Government House.
November 2002	The Committee prepares a synthesis report, due to be presented to Government in November 2002. Government denies them the opportunity to do so.
December 20, 2002	Prime Minister Thaksin conducts a televised dialogue with researchers from UBU, Tai Baan team, Khon Kean University and the Office of Science and Technology. This researchers urge Prime Minister Thaksin to declare a year-round opening based on the findings.
December 24, 2002	Prime Minister Thaksin takes a helicopter tour to inspect the Pak Mun area and confirm impacts with villagers. He meets mostly the pro–dam groups and decides to maintain his earlier decision of a four-month opening.
June 2003	The sub-committee completes its final synthesis report, noting that most research projects had confirmed highly negative impacts on people's livelihoods. It recommends year-round opening of the gates, based on evidence of livelihood restoration during the experimental dam opening. The report is ignored by the Thaksin Government.
June 2007	The sub-committee presents the same report to the Interim Government (installed by the military). It is ignored.

According to Assistant Professor Dr. Nalinee Tantuvanit, a sociology lecturer at Thammasat University, who was a member of the Committee on Overseeing and Monitoring Pak Mun Resolution, the decision to manage the dam was purely political. All the appointed committees provided the Government with legitimacy that gave the appearance that decision making regarding dam was backed up by scientific information, whereas, it was "actually completely political' (Interview, 15 December 2009). Further evidence of this emerged in 2004 when the committee on the Restoration of the Natural Resource and Livelihoods was disbanded in the wake of internal conflicts, lack of budget and lack of real authority to fulfil their mandate. All pretences of compromise came to an end when Thaksin was ousted from power through a military coup on the 19th September 2006 and the new Government overturned Thaksin's ruling and issued a resolution to keep the dam's sluice gates closed year round.

In short, the Thai Government paid little attention to the results of the research it commissioned, other than that by the NSO which simply rubber stamped Thaksin's earlier decision. It paid even less attention to research carried out by impacted peoples and NGOs, claiming that this was biased and romanticized due to their known anti-dam development position. Instead, the Government created a smoke screen by appearing to support scientific research while pursuing its own objective of maintaining dam operations for as much of the year as possible. The Pak Mun Dam case was a tantalizing one for scientists because of the apparent opportunities it created for serious research to influence decision making. In the end it became a sobering reminder of *realpolitik*, revealing how little influence social scientists actually have on the top levels of Government.

2.5 Hua Na Irrigation Project: Allow the results to determine the decisions

In an ideal context, decision making on flow allocations would be based not only on solid scientific findings but also on stakeholder participation, most especially of those directly impacted by the infrastructure. For this participation to be meaningful, stakeholders need to be involved in all stages, agreeing on such issues as: (a) the scope of services; (b) the approach to the work; (c) avoidance of conflicts of interest and (d) a commitment to accepting the final outcomes and recommendations. The obvious question to ask is whether or not such "ideal contexts" ever exist. Is it possible to identify situations where assessments have been in contexts that at least approximate this ideal?

In the Mekong Basin we found only one example of a situation that approximates the above ideal. Once again, it is from a riparian state whose leadership is influenced by public opinion and it does not involve a shared watercourse. In this case, *project paralysis* appears to be a key factor motivating different parties to compromise and negotiate a solution, and this has opened the way for the social scientist to play an active role. The case is the Hua Na Irrigation Project on the Mun River in Northeastern Thailand completed in 2000. This is a 2.1 billion baht investment where flows have yet to be allocated for the intended purpose (irrigation) because opposition from local communities has prevented the irrigation project from being brought into operation. This case is worthy of further examination, as it is an example of what can happen when an EIA –including a social impact assessment– is not done properly at the outset.

The project was planned to provide water to more than 10,000 households living in 61 communities in Si Sa Ket Province (Department of Development and Energy Promotion, 2000), but was never inaugurated because a virtually equal number of riparian residents protested about the likely loss of their aquatic resources. A key point in the controversy was that a full, reliable and comprehensive EIA was never undertaken before project implementation. It was argued that the "people's perspectives" on the anticipated benefits, and on the costs and social consequences of the project, were never extensively studied (Kanokwan, *et al*., 2006). Instead, a rapid top-down exercise was conducted that left none of the parties satisfied. Consultants hired by the Royal Irrigation Department were accused of being careless, and of having conducted a superficial EIA (Thongchai and Pranee, 2004).

Affected villagers, with the support of NGOs, insisted that an EIA should have been done prior to the project design and implementation and that the project should not be allowed to operate until a comprehensive exercise was complete. To help resolve the dispute, the Royal Irrigation Department (RID) accepted in 2007 that a "People's EIA" (PEIA) should be conducted that involves all the key stakeholders, plus independent researchers. The RID allowed an opportunity for scientists to play a facilitating role to assist the Government, the villagers and NGOs to work together. PEAI also provided an opportunity for those most directly impacted to determine the issues to be studied. As a result the PEIA focused primarily on how the scheme should be operated while people's livelihoods are maintained. It ensured that compensation would be fully paid done before the project is commissioned. The key elements included: (i) public consultations involving all stakeholders; (ii) an active steering committee advising on all stages; (iii) frequent monitoring and reporting of progress of the study; (iv) and full participation in the final decision-making stages (Kanokwan, 2009).

The above example suggests that scientists, under the right circumstances, can play a vital role in creating a common (or at least a negotiated) vision for flow allocations. It confirms that when agreement is reached by stakeholders beforehand on the scope of services, the methods to be used and other critical elements of research, consensus can be reached, and acceptance of the results of the common effort are more likely.

3. Other Factors Constraining Scientific Influence on Decision Making

The preceding section suggests that scientists hoping to provide objective information on water resource management issues have limited opportunities to influence decision making, largely because of the positions or attitudes of decision makers towards the use of research results. In most contexts preference is given to pursuing national 'hydraulic missions', or to reaching political compromises that attempt to satisfy conflicting demands. In this section we look at two additional factors that constrain the influence of the scientific community as a whole and of social scientists in particular.

3.1 Changes in dam financing

Internationally, the role of scientists in assessing the impacts of large dams and flow allocations evolved with safeguards and precautionary approaches developed by the World Bank. It is worth recalling that in the 1960s dams were generally viewed as engineering structures - or even as great feats of scientific achievement - with any social or environmental impacts considered to be “inevitable side effects”. This perception started to change in the 1980s when the World Bank, and other multilateral development banks (MDBs), started to responded to public pressure and protests by adopting a series of guidelines to integrate social and environmental concerns into the analysis of proposed projects (World Bank, 1996). The shift corresponded to a much broader shift in thinking on development, ecology and political participation.[1]

The adoption of precautionary approaches gave scientists a greater role in assessing the potential impacts of dams and increased their opportunities to forewarn decision makers of the likely social and environment consequences. As long as countries remained dependent on these institutions to access low-interest capital, the scientists could be guaranteed a role in the mandatory environmental and social impact assessments. However, in recent years, there has been a very significant shift in international financing for dam projects, with private commercial banks and independent power producers becoming increasingly involved (van Gelder, et al, 2002). *As these institutions do not have the same safeguards and precautionary approaches, they have little need to involve social scientists in a serious manner.*

In the Mekong region, the increasing availability of alternative financing has recently resulted in such institutions signing agreements with national governments to conduct feasibility studies for mainstream dams. Investors from Thailand, Malaysia and China are re-examining six dam sites on the Mekong that the MDBs considered too environmentally costly to be developed 10 years ago. These plans are now being revived with alternative financing, but *without proper safeguards or public oversight* and apparently in disregard of the Mekong Agreement of 1995 (TERRA, 2007). The availability of new financing, unconstrained by the ‘old’ safeguards of the multilateral development banks, is possibly the greatest threat to scientists working on impact assessments of dams in the Mekong basin. There is a real risk that they will either be disregarded or, even worse, manipulated by the significant powers that ultimately decide on which dams should be built.

3.2 Linking biophysical and social sciences and ‘translating’ complexity

The Mekong River Commission (MRC) has a mandate, based on the 1995 treaty, to analyse the likely benefits and impacts of different levels of development for the whole basin. The results generated are intended to facilitate regional decision making, at least for the four member states of the Lower Mekong Basin (Laos, Thailand, Cambodia and Vietnam). Within the MRC, a wide range of scientists worked under the Integrated Basin Flow Management (IBFM) Programme to look specifically at how changes in river flow might impact on the Mekong’s ecosystem - and consequently on all the people who depend on this. While this may appear to be a straightforward exercise, it is a highly complex task that requires the close collaboration of a large team of biophysical scientists (covering everything from hydrology to herpetology and sociology). As noted by King and Brown (2006), environmental flow assessments have many specific challenges including transforming hydrological data into an ecologically relevant format, providing quantified predictions of environmental responses to flow change and describing the impacts of river change on common-property users.

For the social scientists, in particular, the first challenge is to understand and distil this complex information and then predict the likely impacts that the changes will have on households and communities. As social scientists are generally not trained in the biophysical sciences, this in itself can be difficult. Assuming this fundamental hurdle can be

[1] Peronal communication. Richard Friend. February 2010

overcome, the social scientists must then develop an understanding of how *similar biophysical impacts* will have very different social consequences for resource users, because of the varied socio-economic and political contexts where they are felt. In other words, the same changes in river flow and ecology will be *felt differently* on the Thai and Lao sides of the river, because people's livelihoods and vulnerability are so different. This requires a thorough understanding of the 'vulnerability contexts' that the river runs through.

The next challenge is how to find a way to extrapolate results from a limited number of very good case studies. Most of the research done on the likely social impacts of dams and diversions is very specific to individual countries. Indeed, very often the research focuses on a small area of particular interest and it is impossible to extrapolate results from the study area to a higher level. Comparable, basin-wide data, that is relevant to river resource users, is almost non-existent and even trans-boundary impact assessments are difficult to find.

Assuming the above obstacles can be overcome, then the information has to be distilled and put into a form that will facilitate decision making: if it is too detailed and technical it will not be used; but if it does not have adequate details it will be returned for further clarification; if it presents the likely impacts in too stark a manner, it will be rejected as being too anti-development; if it highlights particular problems in one country, it could be seen as politically insensitive. In short, the scientist walks a tight rope trying to find a way to provide evidence-based research results, drawn from a complex scientific process, that are easily understood and honest, but not insensitive to the decision-making audience from mixed political backgrounds. To date, there appear to be very few cases where this tight rope has been successfully walked.

4. Discussion and Conclusions

This paper suggests that scientists face particular challenges in assisting the Mekong's political and economic leaders make informed decisions about flow allocations. Decision makers stand before sign posts that point in vastly different directions: on the one hand, the ADB and the World Bank, together with powerful national interests, see the basin as a geographical space filled with abundant opportunities for the development of new infrastructure, particularly 'green' hydropower. They claim this will drive regional economic growth and create win-win situations for all. On the other hand, NGOs and rural activists see infrastructure development as a potential disaster because, they believe, it will be at the expense of powerless groups whose livelihoods rely mostly on river resources. The one side claims there is ample space for dams and diversions, the other vehemently denies it.

In certain contexts, scientists from various disciplines are called upon to provide a basis for informed decision making. However, their work encounters a number of critical challenges, including being ignored while decision makers pursue their own development agenda, or being used as pseudo-science to justify a *fait accompli,* or being manipulated as part of a "competitive" research effort where the most favourable pro-development results are selected. At regional levels, where common ground has to be found on how to manage shared water resources, these challenges are multiplied. The availability of new financing by agencies that do not take a pre-cautionary approach is likely to diminish the influence of social scientists considerably.

However, there are also signs of hope for social scientists working in the region. Interviews with nine researchers working in the Mekong carried out for this article in late 2008 showed that some are having an influence on decision makers, not necessarily on flow allocation decisions *per se* but at least in terms of raising the importance of considering the social impacts of changed flow. The key lessons to emerge are that such influence comes about as a result of: (a) long-term periods of engagement where the researchers (many of whom are Westerners) are able to demonstrate commitment and establish relationships of trust over periods exceeding five years; (b) understanding of the broader political setting and (c) developing clear communication strategies that 'translate' complex scientific results into understandable terminology in national languages and (d) addressing issues of real concern to decision makers. (Interview, Keskinen, Nov 2008).

Some suggest that it is possible, in the right contexts, to create a common vision for objective water resource management research. The use of people's EIAs in Northeastern Thailand, suggests that multi-disciplinary scientific teams can play a critical role in facilitating a new approach to decision making on national projects. Increasingly dialogues, or 'multi-stakeholder platforms', are taking place that involve participants from the hydropower industry, international agencies, river basin organisations, NGOs and impacted people (Dore, 2007).

It remains doubtful that scientific research on the impacts of hydropower dams will actually prevent these being built. However, there are interesting cases emerging outside the water sector in Thailand where academics and NGO activities have managed to prevent major developments taking place on the grounds that the Government did not fully abide with environmental and health impact assessment requirements. For example, in late 2009 the Central Administrative Court order 64 industrial projects to be suspended in the Map Ta Phut industrial zone as the had not complied with impact assessments specified in the 2007 Constitution (Bangkok Post, 25 Feb 2010). Future scientific research may be more productive if it provides the necessary information for impacted peoples to challenge governments to comply to existing legislation, particularly in cases where compensation for lost, or diminished, resources is due.

If PEIAs and similar initiatives are able to gain the necessary political and financial support to sustain them, they could serve as models for other projects. However, numerous technical challenges will remain. Social scientists will need to develop a capacity to work closely with biophysical scientists to gain better insights into how flow changes will impact on local livelihoods. They will need to develop a more systematic understanding of how vulnerability to changed river flow varies along the length of the river, as impacts will not be felt equally. While a long-term focus on basin-wide, trans-boundary impacts is critical, in the short term ways need to be found to extrapolate results from a limited number of good case studies. To facilitate decision making, all scientists involved in river assessments will have to find ways of transforming complex data into messages that are more easily understood by those in power and those seeking to influence them.

The extent to which scientists will actually assist decision-makers in determining fair flow allocations will depend partly on the context they operate in, but equally on their adherence to the highest research standards possible. Fisher advises that before social scientists accept research consultancies they should analyse the 'structures of interest' and should rule out consultancies where such interest would rule out ethical research. He goes on to suggest that researchers should assess the ethical opportunities and threats involved in social impact assessment contracts and should try to negotiate arrangements for transparency to be built into their contracts (Fisher, 2008). In the Mekong region, where the risks of results being ignored, hidden or manipulated is high, such an approach is critical. Equally important, discussions need to take place on how different types of researchers (consultants, universities, institutes, activists and villagers) can create common 'spaces' and use varied opportunities to influence change.

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